

# PUBLIC HEALTH REPORTS

VOL. 52

APRIL 9, 1937

NO. 15

## THE TREATMENT OF BLACKTONGUE WITH A PREPARATION CONTAINING THE "FILTRATE FACTOR", AND EVIDENCE OF RIBOFLAVIN DEFICIENCY IN DOGS

By W. H. SEBRELL, R. H. ONSTOTT, and D. J. HUNT, *Passed Assistant Surgeons, United States Public Health Service, National Institute of Health*

Kline, Keenan, Elvehjem, and Hart (1), Elvehjem and Koehn (2), Jukes and Lepkovsky (3, 4, 5, 6), and Lepkovsky, Jukes, and Krause (7) have shown the presence in the vitamin B complex of a substance distinct from vitamins B<sub>1</sub>, B<sub>6</sub>, and riboflavin, which has been designated as the "chick pellagra vitamin", "filtrate factor", etc.

Koehn and Elvehjem (8) have reported the successful treatment of blacktongue in dogs with a liver concentrate containing the filtrate factor (their vitamin B<sub>2</sub>) and free of riboflavin. These authors suggest that the blacktongue-preventive factor and the filtrate factor are identical.

Fouts, Lepkovsky, Helmer, and Jukes (9) have reported two cases of pellagra which were apparently benefited by treatment with a liver preparation containing the "filtrate factor", and free of vitamins B<sub>1</sub>, B<sub>6</sub>, and lactoflavin. However, Jukes (6) has presented evidence that the distribution of the filtrate factor and the pellagra- or blacktongue-preventive factor in foods is not parallel. Therefore, it was felt that it would be desirable to determine the curative value in blacktongue of a preparation containing the "filtrate factor" made from rice bran.

Through the cooperation of Drs. Samuel Lepkovsky and T. H. Jukes, we were furnished with a supply of rice bran filtrate designated by them as K-37-A and which they found to be rich in the filtrate factor (20 chick units per cc) and free of vitamin B<sub>1</sub> and riboflavin.

### EXPERIMENTAL

Five dogs (Nos. 317, 331, 340, 341, and 343) were placed on our basic blacktongue-producing diet No. 123, the composition of which is given in table 1. On the development of symptoms of blacktongue, treatment was started with rice bran filtrate K-37-A by stomach tube, in gelatin capsules, or mixed with a small portion of the diet which was eaten before the remainder of the dog's ration was fed. Treatment was discontinued when the symptoms subsided and started

again when early signs of recurrence appeared. The significant details in regard to each of the experimental animals are as follows:

TABLE 1.—Composition of basic blacktongue-producing diet No. 123<sup>1</sup>

Articles of diet	Quantity	Protein	Fat	Carbohydrate
	Grams	Grams	Grams	Grams
Corn meal <sup>2</sup>	400	33.6	18.8	296.0
Cowpeas ( <i>Vigna sinensis</i> ) <sup>3</sup>	50	10.7	.7	30.4
Casein (purified) <sup>4</sup>	60	82.0		
Sucrose	32			32.0
Cottonseed oil	30		30.0	
Cod-liver oil	15		15.0	
Sodium chloride	10			
Calcium carbonate	3			
Total nutrients		96.3	64.5	358.4
Nutrients per 1,000 calories		40.1	26.9	149.3

<sup>1</sup> The corn meal, cowpeas (previously coarsely ground), and salt are stirred into water and cooked in a double boiler of enamelware for about 1½ hours. Then the other ingredients are well stirred in, the total weight being brought to 2,400 grams with water (so that 1 gram represents 1 calorie), and this finished mixture is served to the dog *ad libitum*.

<sup>2</sup> Whole maize meal (white) sifted as for human consumption.

<sup>3</sup> The variety known as the California black-eyed pea.

<sup>4</sup> Commercial casein leached for a week in daily changes of acidulated water.

#### Dog No. 317

September 9, 1936: Begins diet 123 in good condition. Weight yesterday, 8.7 kilos.

November 3: Fifty-five days from the beginning of the experiment shows redness of the buccal mucosa suggestive of early blacktongue. Weighs 9.9 kilos. Average daily food consumption from beginning of experiment to date, 679 grams.

January 5: Weighs 7.2 kilos.

November 4–January 17: Showed varying degrees of redness of the buccal mucosa which never became sufficiently extensive to warrant a definite diagnosis of blacktongue. Average daily food consumption during this period, 167 grams.

January 18: Bright red patches on the mucosa of each side of upper lip. Thin pseudomembrane present on the mucosa of the right cheek and on the soft palate. The floor of the mouth is intensely injected. Diagnosis: Acute blacktongue, 131 days from beginning of experiment. Given 16 cc of rice bran filtrate K-37-A in capsules. All regurgitated in a few minutes.

January 19: Lesions of blacktongue much more extensive. Moribund. Weighs 6.6 kilos.

January 20: Found dead 133 days from beginning of experiment and 2 days after onset of acute blacktongue.

*Comment.*—Although the symptoms were not extensive enough to warrant a definite diagnosis of blacktongue until 131 days from the beginning of the experiment, the minor degrees of redness of the buccal mucosa which began 55 days from the beginning of the experiment probably represent transient early symptoms of blacktongue. The very low food consumption and rapid loss in body weight during this period render the animal unsatisfactory for experimental purposes and probably account in some measure for the failure to develop typical buccal lesions until two days before death. Since the rice bran filtrate was regurgitated immediately after administration, this animal cannot be considered of any significance in this experiment.

*Dog No. 331*

September 9, 1936: Begins diet 123 in good condition. Weight yesterday, 7.4 kilos.

November 3: Weighs 7.0 kilos. Fifty-five days from the beginning of the experiment shows reddened patches on mucosa of each side of the upper lip. The mucosa of the cheek and the floor of the mouth are diffusely reddened, suggestive of a beginning attack of blacktongue. Average daily food consumption from beginning of experiment to date, 789 grams.

November 4: The buccal lesions noted yesterday are more severe. Given 10 cc of rice bran filtrate K-37-A mixed with a small amount of the diet.

November 5: Given 10 cc of rice bran filtrate K-37-A mixed with small amount of the diet.

November 6: Buccal lesions have disappeared except for slight redness of the mucosa of the cheeks.

November 24: Weighs 7.2 kilos. Seventy-six days from the beginning of the experiment presents bright red patches on mucosa of each side of the upper lip. Intense reddening of the mucosa of the cheeks and floor of mouth. Slight reddening of the margins of the tongue.

November 25: The buccal lesions are more severe. Given 5 cc of rice bran filtrate K-37-A mixed with a small amount of the diet.

November 26-30: The buccal lesions have considerably receded, although some redness of the mucosa has persisted.

December 1: Weighs 7.2 kilos. Definite recurrence of blacktongue. Red band-like lesion on the mucosa of each side of the upper lip. The mucosa of the cheeks and floor of the mouth is intensely injected. Given 5 cc of rice bran filtrate K-37-A in capsules.

December 2: The buccal lesions are definitely improved.

December 3-7: Given 5 cc of rice bran filtrate K-37-A in small portion of the diet daily.

December 8: Mouth appears to be entirely normal.

December 22: First signs of recurrence of blacktongue. Redness of the mucosa of each side of the upper lip, cheeks, and floor of the mouth. Given 5 cc of rice bran filtrate K-37-A in small portion of the diet.

December 28: Mouth normal.

November 4-January 4: Daily average food consumption 552 grams during this period.

January 5: Weighs 7.7 kilos.

January 5-February 21: During this period a dose of 5 cc of rice bran filtrate K-37-A was given at the first evidence of reddening of the buccal mucosa and in each instance was followed by disappearance of symptoms. Eleven such doses were given. The average daily food consumption was 208 grams.

February 22: Again shows faint redness of the floor of the mouth. Given 10 cc rice bran filtrate K-37-A.

February 23: Weighs 5.3 kilograms. Buccal mucosa appears unusually pale.

February 27: Found dead, 171 days from the beginning of the experiment and 116 days after onset of blacktongue. At autopsy no lesions of blacktongue were found and the cause of death could not be determined. A total of 115 cc of the rice bran filtrate K-37-A was given over a period of 115 days.

*Dog No. 340*

September 9, 1936: Begins diet 123 in good condition. Weight yesterday, 7.8 kilos.

September 22: Thirteen days from the beginning of the experiment shows first signs of blacktongue—an irregular red band-like lesion on the mucosa of each side of the upper lip, reddening of the mucosa of the cheeks and floor of the mouth.

September 26: Symptoms of blacktongue well established. Given 30 cc of rice bran filtrate K-37-A by stomach tube. Vomited afterward.

September 27: Given 30 cc rice bran filtrate K-37-A by stomach tube. Vomited afterward.

September 28: Symptoms of blacktongue receding. Given 15 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

September 29: Weighs 8.3 kilos. Given 15 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

September 30: The lesions of blacktongue have disappeared except for a faint reddening of the mucosa of the upper lip and left cheek.

October 13–March 22: During this period the animal showed varying degrees of reddening of the buccal mucosa typical of early symptoms of recurring attacks of blacktongue and was treated with daily doses of 5 or 10 cc of rice bran filtrate K-37-A, which were discontinued during the intervals in which the lesions on the buccal mucosa showed improvement or disappeared. A total of 505 cc of rice bran filtrate K-37-A was given during this period.

March 23: Weighs 8.7 kilos.

March 24: Apparently normal at 8 a. m. At 9:30 a. m. in semicomatose condition, unable to stand. Given 3 mg of riboflavin (L. F. 356)<sup>1</sup> intramuscularly. At 2 p. m. animal appears to be slightly improved; given 3 mg of riboflavin (L. F. 356) intramuscularly. At 4 p. m. is able to walk, but still appears weak. At 9 p. m. apparently normal; given 2 mg of L. F. 356.

March 25: Animal appears to be entirely normal.

March 27: Normal except for faint injection of mucosa of upper lip. Given 10 cc rice bran filtrate K-37-A. The animal is still alive 199 days after the beginning of the experiment and 186 days after the onset of blacktongue, a total of 605 cc of rice bran filtrate K-37-A having been given over a period of 185 days.

*Dog No. 341*

September 9, 1936: Begins diet 123 in good condition. Weight yesterday, 9.0 kilos.

November 10–21: Slight, transient redness of the buccal mucosa of doubtful significance.

December 1: Weighs 8.5 kilos. Eighty-three days from the beginning of the experiment presents a broad, red streak on the mucosa of each side of the upper lip, injection of the mucosa of the cheeks and floor of the mouth, and reddening of the margins of the tongue. Given 5 cc of rice bran filtrate K-37-A in gelatin capsules.

December 3: Given 10 cc of rice bran filtrate K-37-A mixed with a small portion of the diet.

December 4: Buccal lesions are much improved. Given 5 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 5: Mouth is entirely normal except for a very slight injection of the mucosa of the upper lip. Given 5 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 18–January 12: During this period the animal showed varying degrees of injection of the floor of the mouth and was treated with a daily dose of

<sup>1</sup> This material was a 0.05-percent solution furnished in sealed ampules of 2 cc through the courtesy of Mr. John Hart, of the Winthrop Chemical Co., Inc.

5 cc of rice bran filtrate K-37-A, which was discontinued as the symptoms improved or disappeared. A total of 40 cc of rice bran filtrate was given during this period.

January 12: Weighs 8.7 kilos.

January 13: Entirely normal except for unusual paleness of the buccal mucosa.

January 23: Appears to be in good condition. Buccal mucosa is pale.

January 24: Found dead in the morning, 137 days from the beginning of the experiment and 54 days after the onset of blacktongue. No evidence of blacktongue at autopsy. Cause of death undetermined. A total of 65 cc of rice bran filtrate K-37-A was given over a period of 54 days.

#### *Dog No. 343*

September 9, 1936: Begins diet 123 in good condition. Weight yesterday 8.6 kilos.

November 3: Fifty-five days from the beginning of the experiment presents first sign of an attack of blacktongue—a narrow red band on the mucosa of each side of the upper lip and a diffuse reddening of the cheeks and floor of the mouth.

November 4: Weighs 7.5 kilos. The symptoms of blacktongue are more pronounced. Given 10 cc of rice bran filtrate K-37-A mixed with a small portion of the diet.

November 5: The buccal symptoms are receding. Given 10 cc of rice bran filtrate K-37-A mixed with a small portion of diet.

November 9: Mouth normal.

November 11–December 1: Average daily food consumption during this period, 166 grams. There were slight transient symptoms consisting of reddening of the buccal mucosa.

December 1: Weighs 6.7 kilos.

December 2: Begins recurrence of acute attack of blacktongue.

December 3: Buccal lesions have progressed to pseudomembrane formation on the mucosa of the cheeks and along the margins of the tongue. Given 10 cc rice bran filtrate K-37-A mixed with a small portion of diet.

December 4: Given 10 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 5: Given 10 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 6: Given 5 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 7: Given 10 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 8: Given 10 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 9: Buccal lesions show marked improvement. There are small healing ulcers on the mucosa of the upper lip, and only very small patches of pseudomembrane remain on the mucosa of the cheeks.

December 10: Given 5 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 16: Given 5 cc rice bran filtrate K-37-A mixed with a small portion of the diet.

December 18: Mouth is normal.

December 24–February 26: During this period had symptoms of blacktongue of varying degrees of severity which promptly receded on administration of doses of 5 or 10 cc of rice bran filtrate K-37-A. A total dosage of 180 cc of rice bran filtrate K-37-A was given.

February 27: Mouth normal.



February 28: Found in a comatose condition early in the morning and died a few minutes later. Death occurred 172 days from the beginning of the experiment and 117 days after the onset of blacktongue. At autopsy no evidence of blacktongue was found. The liver was pale and had a yellowish appearance. The cause of death was undetermined. A total of 280 cc of rice bran filtrate K-37-A was given over a period of 117 days.

#### SUMMARY

All five of the animals developed typical signs of acute blacktongue in 131, 55, 13, 83, and 55 days from the beginning of the experiment. One animal (dog no. 317) died in the first acute attack of blacktongue without treatment (the one dose given was regurgitated). The symptoms of blacktongue in the other four animals promptly subsided following treatment with the rice bran filtrate K-37-A, and each recurrent attack subsided on repeated treatment with this material. These results indicate that the rice bran filtrate K-37-A has blacktongue-preventive value and therefore contains the blacktongue-preventive factor in addition to the chick antidermatitis factor, or that the two substances are identical. Three of the animals (dogs nos. 331, 341, and 343) died in 115, 54, and 117 days, respectively, from the beginning of treatment, and 171, 137, and 172 days from the beginning of the experiment, without any signs of blacktongue at the time of death. Their sudden collapse and death appeared to be similar to the condition previously described in this laboratory as "yellow liver" (10, 11) and which may be the same condition encountered by Zimmerman and Burack (12), Spies and Dowling (13), Zimmerman, Cowgill, and Fox (14), and other workers feeding dogs diets deficient in one or more components of the vitamin B<sub>2</sub> complex. It has been our experience with dogs having the condition described as "yellow liver" that the appearance of coma or a semicomatose condition invariably progresses to death within a short time, similar to the sudden deaths of the three animals in this experiment.

While this experiment was in progress we observed that rats on a riboflavin-deficient diet had yellowish livers similar in gross appearance at autopsy to those previously seen in the dogs. Therefore, when the remaining animal (dog no. 340) suddenly collapsed in a semicomatose condition 182 days from the beginning of treatment and 196 days from the beginning of the experiment, without any signs of blacktongue, and its condition appeared to be identical with that which just preceded the death of these other animals, it was immediately treated with a solution of riboflavin (L. F. 356) which Sebrell, Hunt, and Onstott (15) have shown is without value in the treatment of blacktongue. During the day a total dosage of 8 milligrams was given intramuscularly. Within 12 hours from the first dose of this material (3 milligrams), the animal had returned to normal.

This strongly suggests that the basic blacktongue-producing diet no. 123 is deficient in riboflavin, as well as in the blacktongue-preventive factor, and that this deficiency in riboflavin is the cause of the collapse and sudden death of the animals in this experiment without symptoms of blacktongue at the time of death. It also suggests that the condition we have described as "yellow liver" in dogs is the result of riboflavin deficiency.

The animals did not live long enough to make the experiment a conclusive demonstration of the blacktongue-preventive value of the rice bran filtrate, although the fact that symptoms of blacktongue subsided following treatment with relatively small doses in all of the animals, that four of the animals lived for 115, 185, 54, and 117 days after treatment was started, and that there were no symptoms of blacktongue at the time of death, strongly indicate that this material contains a considerable amount of the blacktongue-preventive factor. During the treatment period the total amount of rice bran filtrate K-37-A given each animal (nos. 331, 340, 341, and 343) was calculated to average 0.14 cc, 0.37 cc, 0.13 cc, and 0.34 cc per kilogram of body weight per day, respectively.

The results of this experiment suggest that there may be considerable danger in treating cases of human pellagra with purified preparations of the pellagra-preventive factor, since the absence of unrecognized dietary essentials in these preparations might lead to unfavorable results from conditions other than pellagra.

#### CONCLUSIONS

1. A rice bran filtrate K-37-A, reported rich in the "filtrate factor" and free of riboflavin, showed curative action in blacktongue of dogs.
2. Some evidence is presented that riboflavin is a dietary essential for dogs.

#### REFERENCES

- (1) Kline, O. L., Keenan, J. A., Elvehjem, C. A., and Hart, E. B.: *J. Biol. Chem.*, **99**: 295 (1932-33).
- (2) Elvehjem, C. A., and Koehn, C. J.: *Ibid.*, **108**: 709 (1935).
- (3) Lepkovsky, S., and Jukes, T. H.: *Ibid.*, **111**: 119 (1935).
- (4) Lepkovsky, S., and Jukes, T. H.: *Ibid.*, **114**: 109 (1936).
- (5) Jukes, T. H., and Lepkovsky, S.: *Ibid.*, **114**: 117 (1936).
- (6) Jukes, T. H.: *Ibid.*, **117**: 11 (1936).
- (7) Lepkovsky, S., Jukes, T. H., and Krause, M. E.: *Ibid.*, **115**: 557 (1936).
- (8) Koehn, C. J., and Elvehjem, C. A.: *J. Nutr.*, **11**: 67 (1931).
- (9) Fouts, P. J., Lepkovsky, S., Helmer, O. M., and Jukes, T. H.: *Proc. Soc. Exp. Biol. and Med.*, **35**: 245 (1936).
- (10) Sebrell, W. H.: *Pub. Health Rep.*, **44**: 2697 (1929).
- (11) Sebrell, W. H.: *Natl. Inst. Health Bull. No. 162* (1933).
- (12) Zimmerman, H. M., and Burack, E.: *J. Exp. Med.*, **59**: 21 (1934).
- (13) Spies, T. D., and Dowling, A. S.: *Am. J. Physiol.*, **114**: 25 (1935).
- (14) Zimmerman, H. M., Cowgill, G. R., and Fox, J. C.: *Arch. Neur. and Psychiatry*, **37**: 286 (1937).
- (15) Sebrell, W. H., Hunt, D. J., and Onstott, R. H.: *Pub. Health Rep.*, **52**: 235 (1937).

## LABILE BACTERIAL ANTIGENS AND METHODS OF PREPARING AND PRESERVING THEM<sup>1</sup>

By STUART MUDD, M. D., *Professor of Bacteriology, University of Pennsylvania*,  
E. J. CZARNETZKY, Ph. D., HORACE PETTIT, M. D., and DAVID LACKMAN,  
*Department of Bacteriology, University of Pennsylvania*<sup>2</sup>

Progress in any branch of chemistry is necessarily limited until single reagents become available. In particular, investigation of the chemical and serological mechanisms underlying infectious disease has been limited by lack of pure reagents in the form of single, native antigens and antibodies. Practical procedures such as active and passive immunization and serum therapy have suffered similar limitations from the fact that the immunizing agents used have been complex, frequently toxic and have often undergone serious alteration in the course of preparation.

Discoveries of the past few years have particularly served to emphasize the lability of a number of essential immunizing antigens; the Vi antigen of the typhoid bacillus (1), the capsular polysaccharide of the pneumococcus (2), the labile agglutinin of vaccinia bodies (3), and the labile antigens of hemolytic streptococci (4), serve as examples of antigens whose activity could not withstand the classical methods of chemical extraction and purification.

The capsular polysaccharides of pneumococcus types I, II, and III have recently been separated in closer approximation to their native state (2), utilizing the chloroform method of Sevag (5). The Vi typhoid antigen has been obtained in this laboratory (6) in cell-free, immunizing form, after disintegration of virulent typhoid bacilli by intense sonic vibration of audible frequency in the laboratories of the Johnson Foundation for Medical Physics of the University of Pennsylvania (7). The labile surface antigen of *Streptococcus hemolyticus* (Lancefield Group A) has been isolated in antigenic form following disintegration of the streptococci by each of three physical methods:

1. The bacteria, in a dense suspension, are disintegrated by intense sonic vibrations of audible frequency (7). This method is satisfactory if equipment is available.

2. The streptococci are dried *in vacuo* from the frozen state (8), are transferred to a mortar, and liquid air is poured on them. They are ground with a pestle as the liquid air evaporates (9). This method is effective, but we have discontinued its use because of the danger of explosion of the liquid oxygen in the presence of organic matter, and because of the tendency of the gases evolved to scatter viable bacteria.

<sup>1</sup> Read before the American Philosophical Society, Philadelphia, Pa., on Jan. 2, 1937.

<sup>2</sup> This work has been aided by grants from the United States Public Health Service and from the Abington Memorial Hospital.



3. The streptococci are grown in mass culture, centrifugalized at high speed, and then transferred in the form of a heavy suspension directly to a special ball-mill. The mill with the bacteria in it is attached to a high vacuum line with a condenser interposed, and the bacteria are dried from the frozen state by the lyophile process (8). When the bacteria are dry, the mill is attached to a motor, and is operated in a bath of Dry-Ice in Methyl Cellosolve (10).

After disintegration by any of these three methods the bacterial residue is taken up in saline solution and centrifugalized, and the supernatant fluid is passed through a bacterial filter. The labile surface antigen is isolated from the filtrate by bringing the solution to a certain pH on the acid side of neutrality. The antigen flocculates and may be sedimented in the centrifuge. The sediment is soluble in 0.85 percent NaCl solution. The antigen may be purified by solution in 70 percent ethyl alcohol, with subsequent removal of the alcohol by distillation under high vacuum at 10° C.

Absorption of immune rabbit serum with the homologous labile antigens so prepared completely removes the type-specific antibodies which cause agglutination, promote phagocytosis, and confer on mice passive protection against streptococci of the corresponding type. Injected into rabbits these labile antigens elicit antibodies.

These antigens if kept for a few days in the refrigerator or heated for 1 hour at 56° C. lose completely their power of combining with homologous antibody. This inactivation has been shown to be an oxidation reaction which is readily reversible. Thus when stored or heated in the presence of such reducing agents as cysteine or thioglycolic acid the antigen retains its activity; if inactivated by oxidation, the ability to combine with antibody may be restored by reduction with cysteine or thioglycolic acid.

When reduced by sodium bisulphite the labile antigen becomes lytic for red blood cells. Indeed it appears possible that labile antigen so reduced is the oxygen-labile streptolysin studied in culture filtrates by Neill and Mallory (11) and by Todd (12).

Classification of the  $\beta$ -hemolytic streptococci into serological groups, which correspond broadly to grouping on the basis of pathogenicity and of biochemical reactions, has been accomplished by Lancefield (13). This classification depends upon the presence in each group of a characteristic carbohydrate detectable by the precipitin reaction. The group pathogenic for man (group A) was first subdivided into serological types by Lancefield on the basis of a type-specific protein-like substance "M." The M substances as prepared by Lancefield give type-specific precipitin reactions with homologous antisera, but are not themselves antigenic.

A comprehensive classification of group A hemolytic streptococci into serological types has been achieved by Griffith (14) on the basis of agglutination by type-specific sera. The classifications into groups by Lancefield and into types by Griffith are rapidly becoming accepted as standard by workers in the field.

The labile surface antigen, when a part of the bacterial surface, corresponds in distribution and specificity to Griffith's type-specific agglutinin. When subjected to the chemical procedure used by Lancefield in preparing her type-specific M substance, this labile antigen breaks down into two fractions. One of these fractions exhibits the specificity and other properties of the M substance; the other fraction has the specificity of Lancefield's group carbohydrate. The labile surface antigen may be preserved by the lyophile process.

Another new fraction has also been isolated from  $\beta$ -hemolytic streptococci, although it is not necessary to disrupt the organisms to obtain it (15). It can be obtained in crude form by extraction of the lyophile-processed organisms with moistened ethyl ether. This fraction can be further purified, and it has been shown that the pure product is homomolecular. A phosphorus-free derivative can be crystallized from water or alcohol as the sodium salt. Both the noncrystalline material and the crystalline material are able to hemolyze red blood cells up to a dilution of 1 in 40,000, and also act as leucocidins. The noncrystalline fraction is stable to oxygen and heat and to acids and alkalis, and appears to be similar to the oxygen-stable hemolysin of Todd (12). It does not elicit antibodies when injected into rabbits in the pure form, but is precipitated by antisera prepared against any  $\beta$ -hemolytic streptococci, and can therefore be considered a haptene.

#### REFERENCES

- (1) Felix, A., and Pitt, R. M.: *Lancet*, **2**: 186 (1934).
- (2) Heidelberger, M., Kendall, F. E., and Scherp, H. W.: *J. Exper. Med.*, **64**: 559 (1936).
- (3) Craigie, J., and Wishart, F. C.: *Brit. J. Exp. Path.*, **15**: 390 (1934).
- (4) Mudd, S., Pettit, H., Lackman, D., and Czarnetzky, E. J.: *Proc. Am. Assoc. Path. and Bact.*, *Am. J. Path.*, **12**: 746 (1936); *Proc. Soc. Am. Bact.*, *J. Bact.*, **33**: 63 (1937).
- (5) Sevag, M. G.: *Biochem. Z.*, **273**: 419 (1934).
- (6) Mudd, S., and Greaves, R. E.: To be published.
- (7) Chambers, L. A., and Flosdorf, E. W.: *Proc. Soc. Exp. Biol. and Med.*, **34**: 631 (1936).
- (8) Flosdorf, E. W., and Mudd, S.: *J. Immunology*, **29**: 389 (1935).
- (9) Czarnetzky, E. J.: *Science*, **84**: 355 (1936).
- (10) Mudd, S., Shaw, C. E., Czarnetzky, E. J., and Flosdorf, E. W.: To be published.
- (11) Neill, J. M., and Mallory, T. B.: *J. Exper. Med.*, **44**: 241 (1926).
- (12) Todd, E. W.: *J. Path. and Bact.*, **39**: 299 (1934).
- (13) Lancefield, R. C.: *J. Exp. Med.*, **57**: 571 (1933).
- (14) Griffith, F.: *J. Hygiene*, **34**: 542 (1934).
- (15) Czarnetzky, E. J., Morgan, Isabel M., and Mudd, Stuart: To be published.

## AGE OF GAINFUL MALE WORKERS IN DIFFERENT GEOGRAPHIC REGIONS OF THE UNITED STATES, 1920 AND 1930<sup>1</sup>

Studies on the Age of Gainful Workers No. 2

By WILLIAM M. GAFAFER, Senior Statistician, United States Public Health Service

### INTRODUCTION

The previous paper (1) dealt with the age of gainful male and female workers of the United States in different occupational groups for the census years 1920 and 1930. The percentage age distribution for each occupational group, specific for sex and census year, was compared with the percentage age distribution of all gainful workers by forming the ratio of corresponding percentages. This ratio of an observed percentage to its corresponding defined normal or expected percentage showed, among other things, that in many age groups there was considerable variability of the ratios among the different occupational groups, and that the variability was more pronounced for the females than the males. These observations raise the question of whether the behavior of the ratios may be associated with the geographic location of the worker. Two papers of the series, therefore, will attempt to answer this question; the present one will investigate the males, and the one immediately to follow, the females.

The term *gainful worker* includes, according to the Bureau of the Census (2), "\* \* \* all persons 10 years old and over who usually follow a gainful occupation even though they may not have been actually employed at the time the census was taken. It does not include women doing housework in their own homes without wages and having no other employment, nor children working at home, merely on general household work, on chores, or at odd times on other work."

For present purposes the 48 States and the District of Columbia have been divided into 4 broad groups, each group constituting a geographic region, as follows: Northeastern (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania); Southern (Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas); North Central (Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas); and Western (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Nevada, Utah, Washington, Oregon, and California).<sup>2</sup>

<sup>1</sup> From the Office of Industrial Hygiene and Sanitation, U. S. Public Health Service, Washington, D. C.

<sup>2</sup> The 4 groups of States correspond to the 9 groups used in the publications of the Bureau of the Census, thus: Northeastern = New England + Middle Atlantic; Southern = South Atlantic + East South Central + West South Central; North Central = East North Central + West North Central; and Western = Mountain + Pacific.

The present inquiry, like the previous one, makes use of basic data published by the Bureau of the Census in its reports of 1920 and 1930.

**MALE WORKERS IN DIFFERENT GEOGRAPHIC REGIONS, BY OCCUPATIONAL GROUP**

Table 1 shows for 1920 and 1930 the number of gainful workers in each of the four geographic regions and their distribution among nine groups of occupations. In 1920 the number of workers in the Northeastern, Southern, and North Central regions ranged between 9 and 11 millions, and in the Western region there were approximately 3 millions. In 1930 there were increases as indicated in the table, but the order of the regions remained unchanged. When the various occupational groups are arranged by region, in decreasing order of magnitude with respect to the percentages of workers engaged in the different groups, it will be observed that public service is the only group whose rank is the same for all regions and both census years. The place occupied by this group is last, and the percentages range from 1.7 to 3 percent.

In the following observations based on table 1 the occupational groups giving rise to less than 10 percent in a region will be generally disregarded. In the Northeastern and North Central regions the manufacturing and mechanical industries ranked first in 1920. In the former region those industries claimed almost one-half of the workers, while in the latter the proportion was one-third; in 1930 the situation remained essentially the same, with only small changes in the proportions. In the Southern and Western regions agriculture, forestry, and animal husbandry ranked first with 50 and 29 percent, respectively, the latter percentage approximating that for the manufacturing and mechanical industries of the same region. In 1930 agriculture, forestry, and animal husbandry showed a decrease in the Southern region but continued to rank first; in the Western region there was a small decrease in this occupational group but of sufficient size to cause it and the manufacturing and mechanical industries to interchange places. Thus, it is seen that in all regions, with the exception of the Northeastern, first and second place for both years are always associated with agriculture, forestry, and animal husbandry, and the manufacturing and mechanical industries. In the Northeastern region second place is claimed by trade in 1920 as well as in 1930, with 12 and 16 percent, respectively; in the other regions trade holds third place constantly, varying from 8 percent in the Southern region for 1920 to 15 percent in the Western region for 1930.

TABLE 1.—*Gainful male workers 10 years of age and over in different geographic regions of the United States, specific for occupational group, 1920 and 1930*

Occupational group	1920				1930			
	North-east- ern	Southern	North Central	Western	North-east- ern	Southern	North Central	Western
	Number Percent	Number Percent	Number Percent	Number Percent	Number Percent	Number Percent	Number Percent	Number Percent
All groups.....	9,486,076 100.0	9,733,727 100.0	10,767,489 100.0	3,037,445 100.0	10,811,523 100.0	11,147,202 100.0	12,149,579 100.0	3,969,410 100.0
Agriculture, forestry, animal husbandry.....	886,732 9.3	4,838,853 49.8	3,229,666 30.0	893,749 29.2	807,877 7.5	4,912,090 44.1	3,102,319 25.5	969,913 23.0
Extraction of minerals.....	347,875 3.7	321,375 3.3	280,632 2.7	128,477 4.2	318,391 2.9	339,078 3.0	197,729 1.6	128,306 3.2
Manufacturing and mechanical industries.....	4,379,620 46.2	2,009,050 20.6	3,649,477 33.9	849,430 27.8	4,528,892 41.9	2,473,816 22.2	4,133,189 34.0	1,888,448 27.4
Transportation and communication.....	940,047 9.9	703,227 7.2	909,935 8.4	297,319 9.7	1,131,411 10.5	891,127 8.0	1,150,247 9.5	388,158 9.8
Trade.....	1,174,613 12.4	803,215 8.2	1,232,080 11.4	365,279 11.9	1,131,411 15.7	1,156,742 10.4	1,655,573 13.6	609,063 15.3
Public service (n. e. c.).....	250,606 2.6	225,087 2.3	182,383 1.7	90,990 3.0	294,744 2.7	216,838 1.9	221,344 1.8	105,696 2.7
Professional service.....	382,362 4.0	247,079 2.5	362,693 3.4	134,757 4.4	583,856 5.4	373,485 3.4	544,226 4.5	226,083 5.7
Domestic and personal service.....	432,295 4.6	299,813 2.8	363,994 3.4	151,866 5.0	623,021 5.8	416,116 3.7	607,818 5.0	225,245 5.7
Clerical occupations.....	691,926 7.3	614,922 6.1	547,569 5.1	145,978 4.8	825,922 7.6	368,000 3.3	637,134 5.3	207,438 5.2
All groups.....	9,486,076 100.0	9,733,727 100.0	10,767,489 100.0	3,037,445 100.0	10,811,523 100.0	11,147,202 100.0	12,149,579 100.0	3,969,410 100.0
Agriculture, forestry, animal husbandry.....	886,732 9.3	4,838,853 49.8	3,229,666 30.0	893,749 29.2	807,877 7.5	4,912,090 44.1	3,102,319 25.5	969,913 23.0
Extraction of minerals.....	347,875 3.7	321,375 3.3	280,632 2.7	128,477 4.2	318,391 2.9	339,078 3.0	197,729 1.6	128,306 3.2
Manufacturing and mechanical industries.....	4,379,620 46.2	2,009,050 20.6	3,649,477 33.9	849,430 27.8	4,528,892 41.9	2,473,816 22.2	4,133,189 34.0	1,888,448 27.4
Transportation and communication.....	940,047 9.9	703,227 7.2	909,935 8.4	297,319 9.7	1,131,411 10.5	891,127 8.0	1,150,247 9.5	388,158 9.8
Trade.....	1,174,613 12.4	803,215 8.2	1,232,080 11.4	365,279 11.9	1,131,411 15.7	1,156,742 10.4	1,655,573 13.6	609,063 15.3
Public service (n. e. c.).....	250,606 2.6	225,087 2.3	182,383 1.7	90,990 3.0	294,744 2.7	216,838 1.9	221,344 1.8	105,696 2.7
Professional service.....	382,362 4.0	247,079 2.5	362,693 3.4	134,757 4.4	583,856 5.4	373,485 3.4	544,226 4.5	226,083 5.7
Domestic and personal service.....	432,295 4.6	299,813 2.8	363,994 3.4	151,866 5.0	623,021 5.8	416,116 3.7	607,818 5.0	225,245 5.7
Clerical occupations.....	691,926 7.3	614,922 6.1	547,569 5.1	145,978 4.8	825,922 7.6	368,000 3.3	637,134 5.3	207,438 5.2

1 N. e. c.—not elsewhere classified.



Another fact of sufficient importance to which attention should be directed is the size of the difference between the percentages representing first and second place in the various regions (table 1). The differences for both years with respect to the North Central and Western regions are relatively small. In 1920 the Northeastern region showed a percentage for the manufacturing and mechanical industries almost 4 times that for trade; in 1930 the ratio declined to almost 3. The Southern region in 1920, on the other hand, showed the percentage for agriculture, forestry, and animal husbandry to be almost 2.5 times that for the manufacturing and mechanical industries; in 1930 the ratio decreased to 2.

MALE WORKERS IN DIFFERENT GEOGRAPHIC REGIONS, BY AGE AND  
OCCUPATIONAL GROUP

The age distribution of the gainful male workers in the different geographic regions for 1920 and 1930 according to all occupational groups and for particular occupational groups, respectively, is shown in table 2.

*Age distribution regardless of occupational group.*—When the percentages constituting the age distribution of workers in all occupational groups, specific for region and census year, are arranged in decreasing order of magnitude certain notable facts emerge. Thus, in each region and for both census years, the three ranking age groups are the same and have the same order. These age groups (together with their lower and upper limits irrespective of region and census year) are 25-44 (44 to 51 percent), 45-64 (middle-aged, 24 to 30 percent), and 20-24 (11 to 14 percent), the Southern region for both years showing the smallest percentage of workers in the age groups 25-44 and 45-64 and the largest percentage in the age group 20-24. The remaining age groups, with the exception of the child group (10-17) of the Southern region for both years, have percentages less than 6 percent. In 1920 the Southern child group yielded 9 percent, decreasing in 1930 to 7 percent; the corresponding percentages for the Western region read 3 and 2 percent, respectively, the Northeastern 5 and 3, and the North Central, 4 and 3. It is noteworthy also that in 1920 the old-aged group represents about 4 percent of the workers in each region while in 1930 the corresponding percentage is closer to 5.

*Age distribution by occupational group.*—It is now pertinent to ask how the different occupational groups rank with respect to the proportion of workers in a particular age group, how the regions compare in this regard, and what the effect is of the passage of 10 years. The questions are asked primarily with respect to the child, middle-, and old-aged groups, respectively, that is, the age groups 10-17, 45-64, and 65 and over.

In 1920, according to table 2, there were from 6 to 12 percent of all clerical workers in the child group, the percentage depending upon the geographic location of the workers. Among the regions the Northeastern ranked first with 12 percent and was followed by the Southern and North Central with 10 percent each and the Western with 6 percent. With the exception of the Southern region, where agriculture, forestry, and animal husbandry claimed 13 percent, no other occupational group furnished a corresponding percentage so large. In 1930 this picture is remarkably different in that the regional percentages of the clerically employed children are much reduced. Thus, while the original order of the regions remains unchanged, the Northeastern shows a reduction from 12 to 7 percent, the Southern and North Central each from 10 to 3 percent, and the Western from 6 to 2 percent. The Northeastern (1930) is the only region whose percentage of child workers in the clerical occupations ranks first among the percentages for the different occupational groups. With respect to the child workers, the passage of 10 years effected a decrease in the regional percentages of all occupational groups with the exception of professional service which showed slight increases in all regions.

In 1920 the clerical workers showed between 15 and 19 percent of their number in the middle-aged group, the specific percentage depending upon the geographic location of the workers. No other occupational group in any region furnished a corresponding percentage so low. The highest percentage among the various occupational groups connected with the middle-aged group of 1920 is associated with different occupational groups depending upon the region. Thus in the Northeastern region the highest percentage (36 percent) was given by agriculture, forestry, and animal husbandry; in the Southern region, professional service (31 percent); in the North Central, public service (35 percent), and in the Western, domestic and personal service (32 percent). A lapse of 10 years changed very little the picture of 1920, as indicated thus far. The clerical occupations continued to rank lowest but with an increase of from 1 to 3 percent, depending upon the region. The highest ranking occupational groups continued to rank highest, with but slight changes in the percentages. The passage of 10 years, however, effected notable increases in extraction of minerals in the Northeastern (23 to 28 percent) and North Central (23 to 34 percent) regions, and in public service in the Southern (21 to 28 percent) and Western (23 to 29 percent) regions.

TABLE 2.—Age distribution of gainful male workers in different geographic regions of the United States, specific for occupational group, 1920 and 1930

## NORTHEASTERN

Occupational group	Age group, 1920						Age group, 1930					
	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
All groups	9,496,076	4.357	4.106	11.881	48.665	26.455	10,811,523	2.578	4.016	11.922	48.500	28.131
Agriculture, forestry, animal husbandry	886,732	4.230	3.357	8.365	37.010	35.792	807,877	4.579	4.332	8.938	33.820	36.131
Extraction of minerals	347,875	5.957	4.785	11.239	53.180	22.941	318,391	2.639	4.754	12.380	49.638	28.190
Manufacturing and mechanical industries	4,379,620	4.810	4.182	11.905	50.033	25.560	4,528,892	2.485	4.055	11.025	48.093	28.936
Transportation and communication	940,047	2.311	4.021	14.020	53.043	23.845	1,131,411	1.468	3.177	13.134	54.064	25.140
Trade	1,174,613	3.591	3.059	10.510	49.955	28.804	1,697,409	2.403	3.210	10.559	51.631	27.977
Public service (n. e. c.) <sup>1</sup>	250,606	1.471	4.776	11.133	42.175	33.019	294,744	.393	1.892	7.911	45.806	34.752
Professional service	382,362	.710	1.664	9.989	54.712	28.236	583,856	1.052	2.067	11.036	53.647	27.441
Domestic and personal service	432,295	2.265	2.131	8.178	50.927	31.122	623,021	2.055	3.223	10.054	49.176	29.838
Domestic and personal service	691,926	12.015	8.479	19.007	42.138	15.613	825,922	6.551	8.747	20.876	44.117	17.109
Clerical occupations												

## SOUTHERN

Occupational group	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
All groups	9,753,727	8.824	5.212	13.724	43.600	23.912	11,147,292	6.817	5.143	14.236	43.631	25.325
Agriculture, forestry, animal husbandry	4,858,853	12.919	5.264	12.095	37.895	25.593	4,912,090	11.646	6.284	13.361	35.031	27.001
Extraction of minerals	321,375	4.877	6.489	17.908	52.445	16.970	339,078	2.318	4.802	16.495	55.417	19.721
Manufacturing and mechanical industries	2,009,656	5.263	5.416	15.475	48.391	22.208	2,473,816	3.402	4.733	15.441	49.622	23.705
Transportation and communication	703,217	3.777	6.312	16.750	52.552	19.622	891,127	2.316	3.995	16.212	54.366	21.728
Trade	803,215	3.893	3.306	11.531	50.327	27.041	1,156,742	3.772	3.563	12.006	48.848	27.435
Public service (n. e. c.) <sup>1</sup>	225,087	1.931	9.611	22.414	41.102	20.732	216,838	.861	4.029	15.338	45.930	28.397
Professional service	247,579	.726	1.377	8.745	51.815	31.334	373,485	1.472	1.897	11.228	49.524	30.162
Domestic and personal service	290,813	6.362	4.524	13.231	48.312	23.079	416,116	4.297	4.778	14.531	48.579	23.619
Domestic and personal service	314,922	9.659	6.899	20.364	46.158	14.087	398,000	3.053	5.102	20.012	51.963	17.516
Clerical occupations												

<sup>1</sup> Includes a negligible number of persons of unknown age.<sup>2</sup> N. e. c.—not elsewhere classified.

## NORTH CENTRAL

Occupational group	Age group, 1920						Age group, 1930					
	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
All groups	10,767,480	4.043	12,298	48,499	26,521	4,554	12,140,579	2,500	12,085	47,673	28,427	5,497
Agriculture, forestry, animal husbandry	3,226,660	4.000	4,341	11,818	43,168	6,355	3,102,319	4,747	11,284	38,704	31,615	8,717
Extraction of minerals	289,632	4.023	4,482	11,796	54,064	23,868	107,729	1,179	10,399	47,484	34,222	3,541
Manufacturing and mechanical industries	3,640,477	3.615	4,171	12,810	51,482	24,368	4,133,180	1,455	3,609	50,954	27,263	4,050
Transportation and communication	909,035	2.367	3,758	12,950	52,549	25,115	1,150,247	1,351	2,986	53,342	26,538	3,294
Trade	1,232,080	3.486	2,681	10,001	50,454	29,106	1,665,573	2,438	2,801	50,809	28,658	4,906
Public services (n. e. c.) <sup>1</sup>	182,383	1.117	5,230	11,141	39,237	34,915	221,344	391	1,573	44,035	26,642	10,211
Professional service	302,353	1.659	1,796	10,017	53,778	28,447	544,226	968	2,014	52,831	27,618	5,298
Domestic and personal services	333,994	2.758	2,347	8,561	49,330	30,729	597,818	2,002	9,829	46,706	31,307	7,131
Clerical occupations	547,599	9.739	7,793	20,450	45,023	15,014	637,134	3,418	20,613	49,365	17,240	2,582

## WESTERN

Occupational group	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
	Number	Percent	Percent	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Percent
All groups	3,057,445	2.923	3,474	10,847	50,549	27,892	3,969,410	1,815	11,475	48,083	29,938	5,455
Agriculture, forestry, animal husbandry	993,749	3.608	2,757	10,195	46,084	30,489	1,089,913	3,242	11,290	40,162	32,589	8,486
Extraction of minerals	128,477	1.481	2,757	10,201	55,188	29,553	128,366	710	11,118	52,572	28,869	4,416
Manufacturing and mechanical industries	849,430	2.613	2,757	11,291	51,763	27,081	1,088,448	1,131	11,539	49,623	30,109	4,451
Transportation and communication	297,319	2.280	3,677	12,422	58,462	28,765	389,158	1,133	12,791	55,050	25,483	2,997
Trade	368,279	2.073	2,382	9,084	52,560	29,118	609,063	2,183	9,915	50,792	29,965	4,666
Public services (n. e. c.) <sup>1</sup>	90,590	2.040	8,668	17,948	43,585	23,252	105,090	761	12,689	47,963	28,744	6,775
Professional service	134,757	1.633	1,119	7,761	55,784	29,813	226,083	777	1,663	52,231	30,573	5,254
Domestic and personal services	151,866	2.202	1,962	6,915	50,862	32,389	225,245	1,425	9,502	45,989	34,167	6,028
Clerical occupations	146,978	6.163	5,241	16,551	50,827	19,034	207,438	1,564	18,342	51,821	20,653	2,824

<sup>1</sup> N. e. c. = not elsewhere classified.

With respect to the old-aged group of 1920, agriculture, forestry, and animal husbandry ranked first in the Northeastern (11 percent), Southern (6 percent), and Western (6 percent) regions, and public service ranked first in the North Central (8 percent) with agriculture, forestry, and animal husbandry second (6 percent). The remaining occupational groups regardless of region furnished percentages of 7 percent or less. The middle-aged clerically engaged in each region claimed approximately 2 percent of all clerical workers in a particular region. The situation for 1930 is similar to that for 1920. Attention should, perhaps, be directed to the increases in the North Central and Western regions in agriculture, forestry, and animal husbandry from 6 to 9 percent, and in the latter region the increase in public service from 5 to 7 percent.

RATIO OF OBSERVED PERCENTAGE OF GAINFUL MALE WORKERS IN  
EACH OCCUPATIONAL GROUP TO THE EXPECTED OR NORMAL PERCENT-  
AGE

The percentage age distribution of all gainful workers, regardless of occupation but specific for region and census year, may be assumed to be the "expected" or "normal" percentage age distribution for each occupational group specific for region and census year. As a consequence of this assumption eight expected or normal age distributions emerge, corresponding to a particular region and census year, and the ratios of the observed percentages to their corresponding expected percentages will disclose whether there is a relatively large, a relatively small, or a normal percentage of workers of a particular occupational group in a specific age group of a particular region and census year.

Reference to the expected or normal percentages has already been made in some detail in the previous section under "Age distribution regardless of occupational group." Table 3 presents the calculated ratios, and figures 1 and 2 show them graphically. The broken line in each figure drawn through 1.00 indicates the normal or expected level of gainful workers; when the percentage of persons actually observed in a particular age and occupational group for a region is the same as the expected percentage, the bar will reach the broken line. Obviously when the height of a bar is below (or above) the normal level, the percentage of persons for the age group and group of occupations represented by the bar is less (or greater) than the percentage expected.

An examination of the matter of normality will throw light on the important question of whether there is, with respect to occupational group, a dearth of workers in the middle-aged and old-aged groups, and an excess in the child group, and how the regions and census years compare in these respects.



*Variability of the ratios in the different age groups.*—An inspection of figures 1 and 2 reveals that some age groups are more characteristically normal than others and that this normality varies with geographic region and census year. A study of table 3, together with the aid of appropriate graphs of the ratios, shows the age group 25-44 to be least variable, with the group 45-64 immediately following; these observations hold for each region and each year.<sup>3</sup> The order of the age groups, however, is the same for each region in 1930, namely, 25-44, 45-64, 20-24, 18-19, 65 and over, and 10-17; there is no similarity of order in 1920 beyond that previously indicated. The graphs show further that the curves representing the different occupational groups in each region specific for census year cross and recross each other, which makes it impossible to order the regional-specific occupational groups with any definiteness.<sup>4</sup>

*Age changes in the ratios; specific occupational groups of different regions compared.*—Figure 3 shows graphically how the age changes in the ratios for five different occupational groups compare with respect to the geographic location of the worker; figure 4 shows the same for the four remaining occupational groups. In both figures the points representing the successive ratios have been joined by straight lines to facilitate reading. The figures disclose that, first, the ratios of no occupational group lie consistently above or below the expected normal level of workers; second, the ratios for a specific occupational group for the different regions are in many instances similar for specific age groups; third, the trends of the ratios for 1920 are similar to the trends of the corresponding ratios for 1930, with the exception of public service in the earlier age groups; and finally, and perhaps most important, the regions cannot be placed in a definite order with respect to the ratios of any specific occupational group. The trends of the regional curves will be examined in what is to follow; attention will be directed to exceptional deviations from a trend laid down for a specific occupational group, and to any striking regional differences in specific occupational and age groups.

The figures further disclose that the 18 sets of 4 curves each may be classified into 4 categories depending upon the configuration of the curves as follows: (1) U-shaped, (2) inverted U, (3) ascending, and (4) descending. These four categories will be discussed in the order as given.

<sup>3</sup> The graphs are omitted.

<sup>4</sup> This phenomenon concerning order may also be recognized in figs. 3 and 4.

TABLE 3.—Ratio, by age and geographic region of the United States, of percentage of gainful male workers in a specified occupational group to the percentage for all groups, 1920 and 1930 (percentages shown in table 2)

Occupational group	Age group, 1920						Age group, 1930					
	NORTHEASTERN			SOUTHERN			NORTH CENTRAL			WESTERN		
	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
Agriculture, forestry, animal husbandry.....	0.93	0.82	0.70	0.78	1.35	2.61	1.46	1.01	0.88	0.87	1.07	1.40
Extraction of minerals.....	1.31	1.17	1.05	1.09	0.97	0.44	0.55	1.25	1.30	1.20	0.71	0.55
Manufacturing and mechanical industries.....	1.06	1.02	1.00	1.03	0.97	0.82	0.60	1.04	1.13	1.11	0.93	0.83
Transportation and communication.....	0.51	0.98	1.18	1.09	0.90	0.64	0.43	1.02	1.22	1.21	0.82	0.64
Trade.....	0.79	0.75	0.88	1.03	1.06	0.95	0.44	0.63	0.84	1.15	1.13	0.84
Public service (n. e. c.).....	0.32	1.16	0.94	0.87	1.25	1.72	0.22	1.84	1.63	0.94	0.87	0.90
Professional service.....	0.10	0.41	0.84	1.12	1.07	1.09	0.08	0.26	0.64	1.19	1.31	1.12
Domestic and personal service.....	0.32	0.69	1.05	1.03	1.18	1.24	0.72	0.87	0.96	1.11	0.97	1.18
Clerical occupations.....	2.64	2.07	1.65	0.87	0.59	0.50	1.09	1.32	1.48	1.06	0.61	0.49
Agriculture, forestry, animal husbandry.....	1.46	1.01	0.88	0.87	1.07	1.32	1.46	1.01	0.88	0.87	1.07	1.40
Extraction of minerals.....	0.55	1.25	1.30	1.20	0.71	0.28	0.55	1.25	1.30	1.20	0.71	0.55
Manufacturing and mechanical industries.....	0.60	1.04	1.13	1.11	0.93	0.69	0.60	1.04	1.13	1.11	0.93	0.64
Transportation and communication.....	0.43	1.02	1.22	1.21	0.82	0.42	0.43	1.02	1.22	1.21	0.82	0.39
Trade.....	0.44	0.63	0.84	1.15	1.13	0.83	0.44	0.63	0.84	1.12	1.08	0.60
Public service (n. e. c.).....	0.22	1.84	1.63	0.94	0.87	0.99	0.08	0.26	0.64	1.19	1.31	1.12
Professional service.....	0.08	0.26	0.64	1.19	1.31	1.27	0.08	0.26	0.64	1.19	1.31	1.12
Domestic and personal service.....	0.72	0.87	0.96	1.11	0.97	0.63	0.72	0.87	0.96	1.11	0.97	1.18
Clerical occupations.....	1.09	1.32	1.48	1.06	0.61	0.47	1.09	1.32	1.48	1.06	0.61	0.49
Agriculture, forestry, animal husbandry.....	1.21	1.06	0.96	0.89	1.11	1.40	1.21	1.06	0.96	0.81	1.11	1.59
Extraction of minerals.....	1.00	1.10	1.04	1.06	0.92	0.50	1.00	1.10	1.04	1.00	1.20	0.64
Manufacturing and mechanical industries.....	0.80	1.02	1.04	1.04	0.92	0.78	0.80	1.02	1.04	1.07	0.96	0.74
Transportation and communication.....	0.50	0.92	1.05	1.08	0.98	0.73	0.50	0.92	1.05	1.12	0.93	0.60
Trade.....	0.80	0.66	0.81	1.04	1.10	0.92	0.80	0.66	0.81	1.07	1.01	0.80
Public service (n. e. c.).....	0.28	1.28	0.91	0.81	1.32	1.84	0.28	1.28	0.91	0.92	1.29	1.86
Professional service.....	0.16	0.44	0.81	1.11	1.07	1.16	0.16	0.44	0.81	1.11	1.07	0.96
Domestic and personal service.....	0.68	0.57	0.70	1.02	1.16	1.38	0.68	0.57	0.70	0.98	1.10	1.30
Clerical occupations.....	2.41	1.91	1.66	0.93	0.57	0.44	2.41	1.91	1.66	0.93	0.61	0.46

## WESTERN

Agriculture, forestry, animal husbandry.....	1.23	1.03	0.94	0.91	1.09	1.39	1.79	1.31	0.98	0.84	1.09	1.56
Extraction of minerals.....	.51	.79	.94	1.09	.95	.89	.39	.72	.97	1.09	.96	.81
Manufacturing and mechanical industries.....	.89	1.06	1.04	1.02	.97	.82	.62	.97	1.01	1.03	1.01	.83
Transportation and communication.....	.78	1.06	1.15	1.10	.85	.54	.62	.91	1.11	1.14	.85	.48
Trade.....	1.05	.69	.84	1.04	1.05	.87	1.20	.77	.86	1.06	1.00	.86
Public service (n. e. c.).....	1.70	2.50	1.65	.86	.83	1.04	.41	.95	1.11	1.00	.96	1.24
Professional service.....	.22	.32	.72	1.10	1.07	1.13	.43	.51	.83	1.09	1.02	.96
Domestic and personal service.....	.75	.56	.64	1.01	1.16	1.30	.79	.80	.80	.96	1.14	1.22
Clerical occupations.....	2.11	1.51	1.53	1.01	.68	.50	.89	1.48	1.60	1.08	.60	.52

1 N. e. c.=not elsewhere classified.

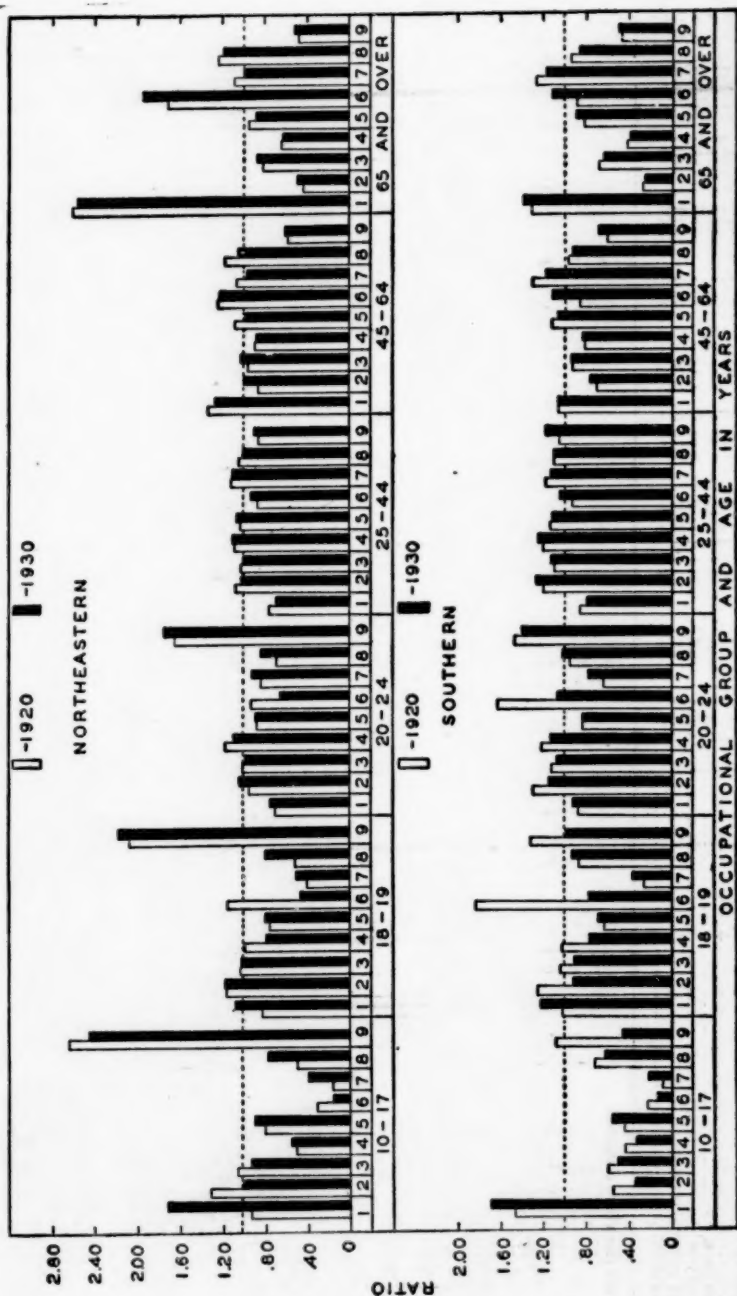


FIGURE 1.—Age-specific ratios of the percentages of gainful male workers in different occupational groups to the percentages for all groups, by geographic region, 1920 and 1930. The numbers 1-9 are defined thus: 1, agriculture, forestry, and animal husbandry; 2, extraction of minerals; 3, manufacturing and mechanical industries; 4, transportation and communication; 5, trade; 6, public service (not elsewhere classified); 7, professional service; 8, domestic and personal service; and 9, clerical occupations.

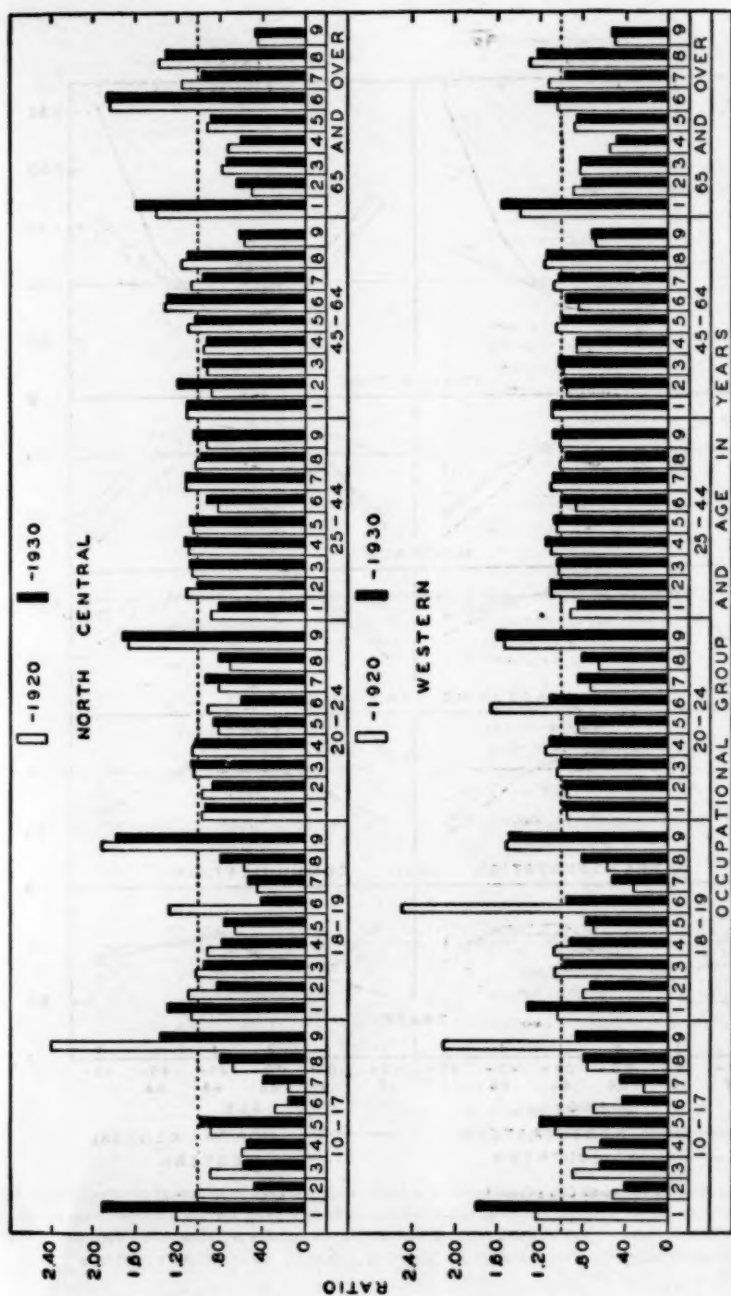


FIGURE 2.—Age-specific ratios of the percentages of gainful male workers in different occupational groups to the percentages for all groups, by geographic region, 1920 and 1930. The numbers 1-9 are defined thus: 1, agriculture, forestry, and animal husbandry; 2, extraction of minerals; 3, manufacturing and mechanical industries; 4, transportation and communication; 5, trade; 6, public service (not elsewhere classified); 7, professional service; 8, domestic and personal services; and 9, clerical occupations.



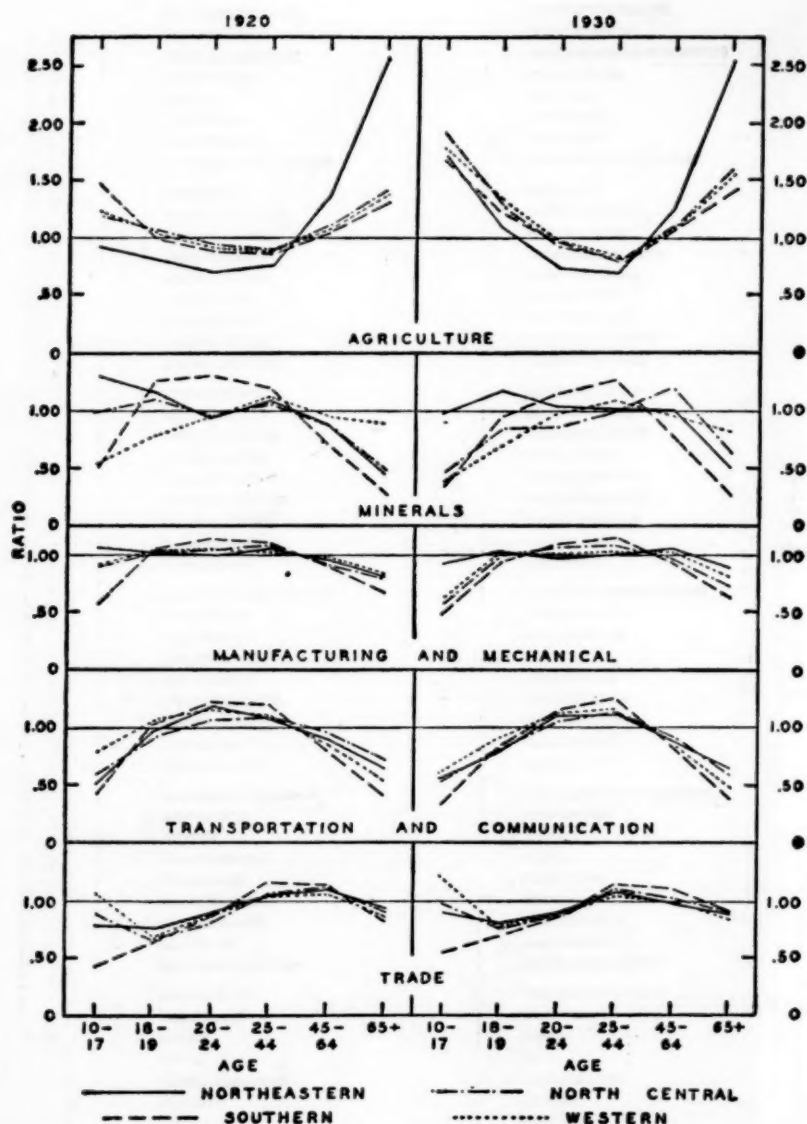


FIGURE 3.—Age-specific ratios of the percentages of gainful male workers in different occupational groups to the percentages for all groups, by geographic region, 1920 and 1930; specific occupational groups of different regions compared. (*Agriculture, forestry, and animal husbandry* is abbreviated *agriculture*, while *extraction of minerals* reads *minerals*. Points are joined by straight lines to facilitate reading.)

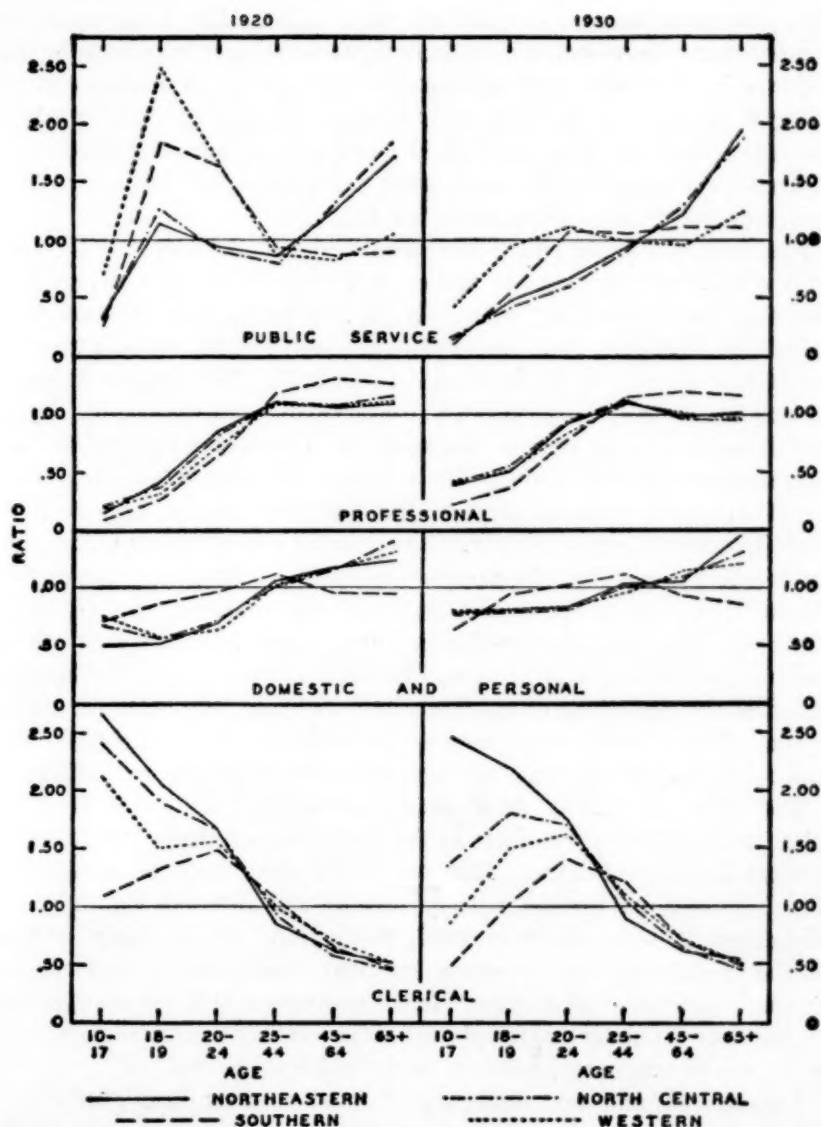


FIGURE 4.—Age-specific ratios of the percentages of gainful male workers in different occupational groups to the percentages for all groups, by geographic region, 1920 and 1930; specific occupational groups of different regions compared. (Points are joined to facilitate reading.)

With the U-shaped class, indicating an excess of workers in the early and late ages and a dearth in the intervening ages, is associated only one occupational group, namely, agriculture, forestry, and animal husbandry. It will be observed that the particular type of curve is definitely more pronounced for the year 1930. For both years the Northeastern region behaves differently from the other regions in that it shows in 1920 and 1930 a uniquely high excess of workers in the old-aged group, and in 1920 a subnormal number of child workers. The essential difference between the two sets of curves with respect to census years lies in the two earlier age groups, the ratios for 1920 being generally lower than those for 1930.

The class of curves which has been designated "inverted U" indicates a dearth of workers in the early and later age groups, with an excess in the intervening ages. With this particular class are associated the following four occupational groups with certain possible exceptions as noted: Extraction of minerals (Northeastern region declining in both census years), manufacturing and mechanical industries (Northeastern region declining in 1920), transportation and communication, and trade. The occupations connected with transportation and communication in the different regions approach the ideal inverted U most closely. The curves representing trade show the greatest distortion, the excesses appearing in the later-age groups. Noteworthy also in connection with this occupational group are the relatively high ratios in the child group and the relatively low ones in the two succeeding age groups. In both census years the Western region shows an excess of child workers in trade; the remaining three regions show a subnormal number of children, the Southern region approximating 50 percent, the lowest of the three regional ratios.

The class of curves designated "ascending" indicates that the subnormal number of workers in the earlier ages becomes an excessive number in the old ages. This particular class may be assigned to three occupational groups, with exceptions as indicated: Public service (disturbed by ages 18-24 in 1920, particularly by the large excesses of the Southern and Western regions), professional service, and domestic and personal service. In all regions all of these occupational groups show a subnormal number of child workers and in most instances an excessive number of workers in the old-aged group.

The fourth and last category, defined "descending", indicates a decrease in the number of workers with increase in age. This class may include only the clerical occupations, with the possible exception of the Southern region of 1930, the two earlier age groups causing the curve to assume the form of the inverted U. Up to and including the age group 20-24 the regions appear distinct, and in both census years they may be placed in decreasing order of magnitude as follows:

Northeastern, North Central, Western, and Southern. In 1920 the child group shows great variability among the regions with excessive numbers of workers; in 1930 the unusual variability persists, but there is a consistent drop, two of the regions, Southern and Western, declining below normal. Beyond the age group 20-24 the regions behaved similarly in both years but with no indication of order.

#### SUMMARY

This paper, the second of a series, investigates the age of gainful male workers in different geographic regions of the United States for the census years 1920 and 1930. The regions include a Northeastern, a Southern, a North Central, and a Western. The percentage age distribution for each occupational group for a particular region and census year is compared with the percentage age distribution of all gainful male workers specific for region and year by forming the ratio of corresponding percentages. The chief observations may be briefly summarized as follows:

1. Regional differences with respect to the number of workers in specific occupational groups were found only in certain age groups. An ordering of the regions with respect to any occupational group is, therefore, not possible.

2. The ratio trends for 1920 are, with a few exceptions, similar to those for 1930.

3. The nine occupational groups generally, regardless of region, may be classified into four categories, depending upon the particular age groups associated with excesses or dearths of workers, thus: (a) Agriculture, forestry, and animal husbandry showed an excess of workers in the early and late age groups and a dearth in the intervening groups; (b) extraction of minerals, manufacturing and mechanical industries, transportation and communication, and trade showed a dearth in the early and late age groups, with an excess intervening; (c) public service, professional service, and domestic and personal service showed a dearth in the earlier age groups that gradually reached an excessive number in the late ages; and (d) clerical occupations showed excesses in the early ages that were gradually replaced by a dearth in the older ages.

#### REFERENCES

- (1) Gafafer, W. M.: (1937) Age of gainful workers of the United States, 1920 and 1930. Studies on the age of gainful workers no. 1. Pub. Health Rep., 52: 269-281.
- (2) U. S. Department of Commerce, Bureau of the Census: (1933) Fifteenth Census of the United States, 1930. Population, v. 5, General Report on Occupations. Government Printing Office, Washington, D. C. P. 114.

**DEATHS DURING WEEK ENDED MARCH 20, 1937**

(From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

	Week ended Mar. 20, 1937	Correspond- ing week, 1936
<b>Data from 86 large cities of the United States:</b>		
Total deaths.....	9,365	9,852
Average for 3 prior years.....	9,276	
Total deaths, first 11 weeks of year.....	114,080	108,198
Deaths under 1 year of age.....	580	590
Average for 3 prior years.....	619	
Deaths under 1 year of age, first 11 weeks of year.....	6,987	6,373
<b>Data from industrial insurance companies:</b>		
Policies in force.....	69,487,166	68,197,513
Number of death claims.....	15,230	15,179
Death claims per 1,000 policies in force, annual rate.....	11.4	11.6
Death claims per 1,000 policies, first 11 weeks of year, annual rate.....	11.6	11.2



# PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

## UNITED STATES

### CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 27, 1937, and Mar. 28, 1936

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936
<b>New England States:</b>								
Maine.....	3		13	13	15	216	3	0
New Hampshire.....				2	47	43	0	1
Vermont.....						841	0	0
Massachusetts.....	3	11			782	1,016	4	8
Rhode Island.....					386	120	0	2
Connecticut.....	8	4	16	9	573	79	1	3
<b>Middle Atlantic States:</b>								
New York.....	41	36	32	22	638	3,004	14	39
New Jersey.....	13	16	12	40	2,183	304	5	8
Pennsylvania.....	30	38			333	1,337	6	10
<b>East North Central States:</b>								
Ohio.....	16	30	62	242	238	411	4	15
Indiana.....	12	19	92	56	84	10	4	8
Illinois.....	23	25	168	52	81	51	5	17
Michigan.....	11	12	6	22	92	63	2	7
Wisconsin.....	6	1	103	53	32	88	1	1
<b>West North Central States:</b>								
Minnesota.....	4	3	3	1	50	394	4	3
Iowa.....	1	6	2	5	4	1	1	2
Missouri.....	12	25	192	1,464	27	24	3	9
North Dakota.....		1	6	9		3	0	2
South Dakota.....					2	2	0	0
Nebraska.....	1	8		1	11	64	0	1
Kansas.....	11	17	11	30	19	13	1	2
<b>South Atlantic States:</b>								
Delaware.....		2		1	48	49	1	0
Maryland.....	5	5	28	57	809	304	5	20
District of Columbia.....	14	14	1	2	114	46	2	10
Virginia.....	14	16		1,213	379	146	12	10
West Virginia.....	5	13	165	184	19	52	7	9
North Carolina.....	12	18	191	169	134	83	5	9
South Carolina.....	3	5	812	533	32	23	0	18
Georgia.....	10	16	634	585			1	10
Florida.....	5	3	19	84	8	8	5	8
<b>East South Central States:</b>								
Kentucky.....	8		79	167	151	105	29	47
Tennessee.....	13	4	184	549	24	41	7	17
Alabama.....	12	5	1,330	1,750	8	18	14	3
Mississippi.....	2	4					0	5
<b>West South Central States:</b>								
Arkansas.....	5	12	349	953	1	15	3	5
Louisiana.....	19	9	132	279	7	90	0	3
Oklahoma.....	3	2	168	201	48	10	2	5
Texas.....	43	38	1,166	436	518	440	9	24

See footnotes at end of table.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 27, 1937, and Mar. 28, 1936—Continued*

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936
<b>Mountain States:</b>								
Montana.....	1	5	40	22	60	9	0	1
Idaho.....			2	11	25	10	0	1
Wyoming.....		2		58		21	0	2
Colorado.....	3	10			5	24	0	0
New Mexico.....	1			43	54	87	2	4
Arizona.....		2	64	202	265	121	2	0
Utah <sup>1</sup> .....			1		20	13	0	0
<b>Pacific States:</b>								
Washington.....	1	1	2	9	28	293	4	0
Oregon <sup>1</sup> .....		2	33	159	9	416	3	1
California.....	20	23	221	1,768	97	2,597	4	6
<b>Total.....</b>	<b>404</b>	<b>473</b>	<b>6,359</b>	<b>11,475</b>	<b>8,759</b>	<b>13,005</b>	<b>176</b>	<b>354</b>
<b>First 12 weeks of year.....</b>	<b>6,300</b>	<b>7,282</b>	<b>250,891</b>	<b>97,288</b>	<b>70,681</b>	<b>101,648</b>	<b>2,019</b>	<b>2,864</b>

Division and State	Pollomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936
<b>New England States:</b>								
Maine.....	0	0	34	25	0	0	2	2
New Hampshire.....	0	0	29	3	0	0	0	0
Vermont.....	0	0	10	49	0	0	0	0
Massachusetts.....	0	0	269	299	0	0	2	1
Rhode Island.....	0	0	60	29	0	0	1	0
Connecticut.....	0	0	167	102	0	0	1	1
<b>Middle Atlantic States:</b>								
New York.....	0	0	1,056	1,116	0	0	14	10
New Jersey.....	1	0	155	541	0	0	1	1
Pennsylvania.....	2	1	623	571	0	0	4	12
<b>East North Central States:</b>								
Ohio.....	4	1	339	440	3	0	2	71
Indiana.....	0	0	268	298	8	10	0	0
Illinois.....	3	0	779	931	63	14	3	11
Michigan.....	0	0	891	397	20	1	2	5
Wisconsin.....	0	0	432	574	1	6	8	0
<b>West North Central States:</b>								
Minnesota.....	0	0	160	463	13	13	1	2
Iowa.....	1	0	327	209	33	17	1	0
Missouri.....	0	0	300	193	68	16	2	0
North Dakota.....	0	0	33	75	15	7	0	0
South Dakota.....	0	0	59	38	0	21	2	0
Nebraska.....	0	1	95	241	14	35	0	0
Kansas.....	0	0	415	314	23	30	1	1
<b>South Atlantic States:</b>								
Delaware.....	0	0	2	3	0	0	0	0
Maryland <sup>1</sup> .....	0	0	35	99	0	0	6	4
District of Columbia.....	0	0	14	21	0	0	0	0
Virginia.....	0	0	30	60	1	0	5	4
West Virginia.....	0	0	40	44	0	0	3	4
North Carolina.....	0	3	39	20	0	1	2	5
South Carolina <sup>1</sup> .....	1	0	5	6	0	0	2	1
Georgia <sup>1</sup> .....	1	0	21	14	0	1	1	2
Florida.....	0	0	8	10	0	0	2	1
<b>East South Central States:</b>								
Kentucky.....	1	0	36	54	0	0	4	0
Tennessee.....	0	0	25	52	0	1	2	1
Alabama <sup>1</sup> .....	2	0	16	10	0	0	2	2
Mississippi <sup>1</sup> .....	0	0	5	15	0	0	1	0

See footnotes at end of table.

*Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 27, 1937, and Mar. 28, 1936—Continued*

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936	Week ended Mar. 27, 1937	Week ended Mar. 28, 1936
<b>West South Central States:</b>								
Arkansas.....	0	0	23	19	1	1	0	1
Louisiana.....	0	0	4	22	5	1	5	2
Oklahoma <sup>1</sup> .....	1	0	19	24	0	1	0	2
Texas <sup>2</sup> .....	1	3	83	75	7	2	9	6
<b>Mountain States:</b>								
Montana.....	0	0	36	129	37	5	0	3
Idaho.....	0	0	37	118	1	7	0	0
Wyoming.....	0	1	16	88	2	2	0	0
Colorado.....	0	0	46	103	3	1	0	0
New Mexico.....	0	0	30	65	2	1	0	0
Arizona.....	0	0	18	12	0	0	1	3
Utah <sup>3</sup> .....	0	0	12	87	0	4	0	0
<b>Pacific States:</b>								
Washington.....	1	1	32	100	6	19	0	2
Oregon <sup>4</sup> .....	1	0	31	43	23	1	2	6
California.....	0	3	186	343	8	1	1	3
<b>Total.....</b>	<b>20</b>	<b>14</b>	<b>7,410</b>	<b>8,544</b>	<b>357</b>	<b>219</b>	<b>95</b>	<b>168</b>
<b>First 12 weeks of year.....</b>	<b>259</b>	<b>216</b>	<b>80,773</b>	<b>95,213</b>	<b>3,654</b>	<b>2,664</b>	<b>1,308</b>	<b>1,228</b>

<sup>1</sup> New York City only.

<sup>2</sup> Week ended earlier than Saturday.

<sup>3</sup> Typhus fever, week ended Mar. 27, 1937, 32 cases, as follows: South Carolina, 4; Georgia, 15; Alabama, 5; Texas, 8.

<sup>4</sup> Exclusive of Oklahoma City and Tulsa.

<sup>5</sup> Rocky Mountain spotted fever, week ended Mar. 27, 1937, Oregon, 1 case.

### SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Menin- gococ- cus menin- gitis	Diph- theria	Influ- enza	Mala- ria	Mea- sles	Pol- ioma	Poli- mye- litis	Scarlet fever	Small- pox	Ty- phoid fever
<b>December 1936</b>										
Massachusetts.....	12	18		2	2,005	1		753	0	5
Puerto Rico.....		43	44	1,055	99		1			191
<b>January 1937</b>										
Massachusetts.....	13	20			4,024		1	992	0	3
Puerto Rico.....		42	111	963	147	1	1		0	170
<b>February 1937</b>										
Arizona.....	11	16	2,971	1	942	2	0	101	0	1
Hawaii Territory.....		14	24		1,317		3		0	3
Kansas.....	6	32	2,944	1	22	1		1,400	94	3
Louisiana.....	4	47	1,291	23	16		2	37	0	22
Massachusetts.....	15	21		1	3,503	2	1	1,002	0	3
Montana.....	4	15	1,692		81		0	248	86	2
Nevada.....			71		6		0	48	2	0
North Dakota.....	4	4	79		8		1	174	67	0
Oregon.....	2	3	2,044	1	32		2	145	89	4
Rhode Island.....	4	3	85		866		0	271	0	2
Tennessee.....	25	68	3,151	13	227	7	1	92	1	23
Texas.....	39	197	15,929	539	1,483	101	9	397	15	41
Washington.....	7	17	191		159		0	167	22	6

## Summary of monthly reports from States—Continued

December 1936		February 1937—Continued		February 1937—Continued	
Massachusetts:	Cases	Chicken pox—Continued.	Cases	Ophthalmia neonatorum:	Cases
Anthrax.....	2	North Dakota.....	85	Hawaii Territory.....	2
Chicken pox.....	1,393	Oregon.....	149	Massachusetts.....	81
Dysentery (amoebic).....	1	Rhode Island.....	215	Paratyphoid fever:	
Encephalitis, epidemic or lethargic.....	8	Tennessee.....	222	Hawaii Territory.....	1
German measles.....	63	Texas.....	774	Massachusetts.....	2
Mumps.....	663	Washington.....	624	Texas.....	2
Ophthalmia neonatorum.....	96	Dengue:		Puerperal septicaemia:	
Paratyphoid fever.....	1	Texas.....	62	Washington.....	1
Rabies in animals.....	13	Dysentery:		Rabies in animals:	
Septic sore throat.....	6	Arizona.....	2	Louisiana.....	25
Tetanus.....	1	Hawaii Territory (amoebic).....	2	Massachusetts.....	26
Trachoma.....	1	Louisiana (amoebic).....	8	Texas.....	11
Undulant fever.....	3	Massachusetts (bacillary).....	4	Washington.....	20
Whooping cough.....	1,738	Rhode Island (bacillary).....	1	Scabies:	
Puerto Rico:		Tennessee (bacillary).....	6	Oregon.....	70
Chicken pox.....	7	Texas (amoebic).....	2	Septic sore throat:	
Dysentery.....	11	Texas (bacillary).....	27	Kansas.....	2
Filaria.....	1	Washington (bacillary).....	1	Louisiana.....	1
Leprosy.....	17	Encephalitis, epidemic or lethargic:		Massachusetts.....	44
Mumps.....	17	Arizona.....	1	Montana.....	17
Ophthalmia neonatorum.....	2	Kansas.....	2	Oregon.....	13
Puerperal septicaemia.....	7	Louisiana.....	1	Rhode Island.....	8
Tetanus.....	18	Massachusetts.....	5	Tennessee.....	4
Tetanus, infantile.....	1	Tennessee.....	1	Tetanus:	
Whooping cough.....	25	Texas.....	4	Tennessee.....	2
January 1937		Washington.....	2	Washington.....	1
Massachusetts:		German measles:		Trachoma:	
Chicken pox.....	1,772	Arizona.....	9	Arizona.....	20
Dysentery (amoebic).....	1	Kansas.....	14	Massachusetts.....	4
Encephalitis, epidemic or lethargic.....	3	Massachusetts.....	77	Montana.....	1
German measles.....	76	Montana.....	3	Oregon.....	2
Mumps.....	719	Rhode Island.....	42	Tennessee.....	47
Ophthalmia neonatorum.....	69	Tennessee.....	62	Tularemia:	
Rabies in animals.....	17	Washington.....	10	Kansas.....	1
Septic sore throat.....	14	Hookworm disease:		Louisiana.....	10
Trachoma.....	1	Hawaii Territory.....	6	Tennessee.....	5
Undulant fever.....	5	Louisiana.....	10	Texas.....	2
Whooping cough.....	2,167	Impetigo contagiosa:		Typhus fever:	
Puerto Rico:		Kansas.....	9	Texas.....	3
Chicken pox.....	32	Oregon.....	46	Undulant fever:	
Dysentery.....	17	Tennessee.....	4	Kansas.....	4
Leprosy.....	1	Washington.....	3	Louisiana.....	5
Mumps.....	7	Jaundice, infectious:		Massachusetts.....	1
Ophthalmia neonatorum.....	3	Hawaii Territory.....	4	Texas.....	4
Puerperal septicaemia.....	1	Oregon.....	4	Washington.....	1
Tetanus.....	4	Lead poisoning:		Vincent's infection:	
Tetanus, infantile.....	5	Massachusetts.....	2	Kansas.....	2
Whooping cough.....	42	Leprosy:		North Dakota.....	2
February 1937		Hawaii Territory.....	4	Oregon.....	5
Chicken pox:		Mumps:		Tennessee.....	4
Arizona.....	108	Arizona.....	112	Washington.....	1
Hawaii Territory.....	152	Hawaii Territory.....	92	Whooping cough:	
Kansas.....	444	Kansas.....	1,008	Arizona.....	29
Louisiana.....	15	Louisiana.....	21	Hawaii Territory.....	11
Massachusetts.....	1,438	Massachusetts.....	736	Kansas.....	187
Montana.....	142	Montana.....	456	Louisiana.....	48
Nevada.....	1	North Dakota.....	152	Massachusetts.....	1,832
		Oregon.....	101	Montana.....	28
		Rhode Island.....	16	Nevada.....	2
		Tennessee.....	111	North Dakota.....	15
		Texas.....	1,462	Oregon.....	116
		Washington.....	890	Rhode Island.....	74
				Tennessee.....	166
				Texas.....	508
				Washington.....	103

## WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 20, 1937

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diph- theria cases	Influenza		Mea- sles cases	Pneu- monia deaths	Scar- let fever cases	Small- pox cases	Tuber- culosis deaths	Ty- phoid fever cases	Whoop- ing cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities: 5-year average.....	238	656	137	7,000	968	2,724	22	423	22	1,481	-----
Current week <sup>1</sup> .....	168	550	104	3,255	943	2,709	69	417	21	1,456	-----
Maine:											
Portland.....	0	-----	0	1	4	5	0	1	0	1	20
New Hampshire:											
Concord.....	0	-----	2	0	0	0	0	1	0	0	7
Manchester.....	0	-----	5	0	1	2	0	0	0	0	27
Nashua.....	0	-----	-----	0	-----	0	0	-----	0	0	-----
Vermont:											
Barre.....	0	-----	0	0	0	0	0	0	0	1	0
Burlington.....	0	-----	0	0	0	2	0	0	0	0	4
Rutland.....	0	-----	0	1	0	0	0	0	0	2	5
Massachusetts:											
Boston.....	0	-----	0	10	36	78	0	11	1	111	243
Fall River.....	0	-----	0	22	5	3	0	1	0	2	33
Springfield.....	0	-----	0	9	4	9	0	0	0	3	37
Worcester.....	0	-----	0	145	3	8	0	1	1	28	69
Rhode Island:											
Pawtucket.....	0	-----	0	16	0	2	0	0	0	0	12
Providence.....	1	-----	0	341	6	44	0	1	0	36	59
Connecticut:											
Bridgeport.....	0	1	1	15	2	62	0	1	0	1	32
Hartford.....	0	2	0	0	8	5	0	0	0	3	26
New Haven.....	0	-----	0	0	1	8	0	1	0	0	29
New York:											
Buffalo.....	54	47	7	253	187	485	0	98	2	59	1,655
New York.....	0	4	0	0	10	3	0	2	0	22	77
Rochester.....	0	-----	0	6	2	71	0	0	0	53	57
Syracuse.....	0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
New Jersey:											
Camden.....	0	2	1	0	1	6	0	0	0	4	45
Newark.....	0	2	2	951	15	25	0	1	0	13	133
Trenton.....	0	-----	0	2	7	10	0	4	0	1	51
Pennsylvania:											
Philadelphia.....	3	6	4	23	60	239	0	26	1	84	650
Pittsburgh.....	1	3	2	52	35	54	0	9	0	37	216
Reading.....	0	-----	1	8	1	9	0	0	0	7	33
Scranton.....	0	-----	-----	0	-----	28	0	-----	0	0	-----
Ohio:											
Cincinnati.....	5	-----	2	93	19	10	0	17	0	14	172
Cleveland.....	3	26	1	61	33	65	0	17	0	44	242
Columbus.....	2	1	1	1	9	4	0	6	0	15	91
Toledo.....	1	-----	0	72	1	12	0	6	0	38	65
Indiana:											
Anderson.....	0	-----	0	1	2	21	0	1	0	1	12
Fort Wayne.....	1	-----	0	0	2	0	0	0	0	3	26
Indianapolis.....	0	-----	0	33	19	53	1	4	0	48	120
South Bend.....	0	-----	0	1	4	8	0	1	0	5	16
Terre Haute.....	4	-----	0	0	0	0	0	0	0	0	19
Illinois:											
Alton.....	0	-----	0	0	1	12	0	0	0	0	8
Chicago.....	17	19	7	42	54	300	0	43	2	49	757
Elgin.....	1	-----	0	0	1	0	0	0	0	3	10
Moline.....	0	-----	0	0	5	0	0	0	0	10	12
Springfield.....	0	-----	0	0	5	15	0	0	0	3	33
Michigan:											
Detroit.....	9	5	5	7	36	477	0	17	3	85	282
Flint.....	1	-----	0	0	6	29	0	1	0	5	30
Grand Rapids.....	1	-----	0	25	2	12	0	0	0	28	37
Wisconsin:											
Kenosha.....	0	-----	0	1	0	4	0	0	0	0	9
Madison.....	0	-----	0	0	0	2	0	1	0	3	19
Milwaukee.....	0	1	1	6	15	82	0	6	0	21	117
Racine.....	0	-----	0	1	0	9	0	0	0	0	13
Superior.....	0	-----	0	0	0	0	0	0	0	11	6

<sup>1</sup> Figures for Buffalo and Raleigh estimated; current reports not received.



## City reports for week ended Mar. 20, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
<b>Minnesota:</b>											
Duluth.....	0	-----	0	1	5	22	0	1	0	3	25
Minneapolis.....	0	-----	1	1	9	23	0	4	0	42	108
St. Paul.....	0	1	1	1	4	7	0	2	0	86	59
<b>Iowa:</b>											
Cedar Rapids.....	0	-----	-----	1	-----	2	0	-----	0	0	-----
Davenport.....	0	-----	-----	0	-----	3	0	-----	0	2	-----
Sioux City.....	0	-----	-----	0	-----	22	1	-----	1	0	-----
Waterloo.....	0	-----	-----	1	-----	15	0	-----	0	20	-----
<b>Missouri:</b>											
Kansas City.....	1	2	1	0	18	100	0	0	0	10	109
St. Joseph.....	0	-----	0	1	6	20	49	3	0	1	39
St. Louis.....	8	3	1	2	12	86	2	10	0	108	261
<b>North Dakota:</b>											
Fargo.....	0	-----	0	0	1	8	0	0	0	0	7
Grand Forks.....	0	-----	-----	0	-----	0	1	-----	0	2	-----
Minot.....	0	-----	0	0	0	0	0	0	0	0	9
<b>South Dakota:</b>											
Aberdeen.....	0	-----	-----	0	-----	7	0	-----	0	0	-----
Sioux Falls.....	0	-----	0	0	0	0	0	0	0	0	8
<b>Nebraska:</b>											
Omaha.....	1	-----	1	1	11	8	1	1	0	4	61
<b>Kansas:</b>											
Lawrence.....	0	-----	0	0	1	0	0	0	0	3	3
Topeka.....	0	-----	1	0	2	10	0	0	0	0	13
Wichita.....	2	1	1	2	1	8	9	0	1	9	23
<b>Delaware:</b>											
Wilmington.....	0	-----	0	8	1	1	0	1	0	1	20
<b>Maryland:</b>											
Baltimore.....	3	12	2	757	29	23	0	11	1	73	265
Cumberland.....	0	-----	0	0	1	0	0	0	0	1	8
Frederick.....	0	1	0	7	1	0	0	0	0	0	6
<b>District of Columbia:</b>											
Washington.....	3	2	1	59	29	17	0	13	1	9	195
<b>Virginia:</b>											
Lynchburg.....	0	-----	2	1	5	0	0	0	0	3	16
Norfolk.....	0	-----	0	0	6	1	0	4	0	1	37
Richmond.....	2	-----	3	0	7	3	0	1	0	2	50
Roanoke.....	0	-----	0	51	4	0	0	0	0	1	15
<b>West Virginia:</b>											
Charleston.....	1	-----	0	0	8	2	0	2	0	4	28
Huntington.....	0	-----	-----	0	-----	0	0	-----	0	0	-----
Wheeling.....	0	-----	0	0	2	5	0	0	0	1	22
<b>North Carolina:</b>											
Gastonia.....	0	-----	-----	0	-----	0	0	-----	0	1	-----
Raleigh.....	0	1	0	0	1	2	0	2	0	1	14
Wilmington.....	0	17	0	0	2	7	0	2	0	2	21
<b>South Carolina:</b>											
Charleston.....	0	158	5	0	5	3	0	0	0	0	30
Columbia.....	0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Florence.....	0	-----	0	0	2	0	0	0	0	0	10
Greenville.....	0	-----	0	0	4	0	0	2	0	0	29
<b>Georgia:</b>											
Atlanta.....	0	54	3	0	11	3	0	2	0	2	73
Brunswick.....	0	-----	0	0	0	0	0	0	0	0	3
Savannah.....	1	81	1	0	1	1	0	2	0	1	30
<b>Florida:</b>											
Miami.....	3	-----	3	2	6	0	0	1	0	0	48
Tampa.....	1	-----	0	0	7	1	0	0	0	3	30
<b>Kentucky:</b>											
Ashland.....	1	3	0	0	3	1	0	1	0	0	9
Covington.....	0	-----	0	5	5	2	0	2	0	0	30
Lexington.....	0	15	0	7	5	0	0	2	0	7	26
Louisville.....	1	-----	1	2	12	10	0	8	0	22	70
<b>Tennessee:</b>											
Knoxville.....	0	5	2	3	7	0	0	1	0	0	23
Memphis.....	1	-----	3	0	15	7	0	4	1	26	93
Nashville.....	3	-----	2	0	1	4	0	6	0	0	54
<b>Alabama:</b>											
Birmingham.....	0	55	8	0	14	4	0	2	0	5	96
Mobile.....	1	-----	5	0	4	2	0	1	0	1	26
Montgomery.....	0	7	-----	0	-----	0	0	-----	0	0	-----
<b>Arkansas:</b>											
Fort Smith.....	0	-----	-----	0	-----	1	0	-----	0	0	-----
Little Rock.....	0	-----	1	0	7	8	0	2	0	0	10

## City reports for week ended Mar. 20, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Small-pox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles.....	0		0	0	1	0	0	0	0	0	
New Orleans.....	11	10	7	0	20	7	0	10	1	0	178
Shreveport.....	3		1	1	10	1	0	0	1	9	26
Oklahoma:											
Oklahoma City.....	1	12	1	0	11	6	0	1	0	0	47
Tulsa.....	1			1		3	0		0	3	
Texas:											
Dallas.....	4	5	2	76	10	16	0	5	0	10	69
Fort Worth.....	0		0	33	4	6	0	1	0	6	33
Galveston.....	0		0	0	0	2	0	0	0	0	15
Houston.....	2	5	1	1	13	4	1	5	1	6	95
San Antonio.....	1		4	23	3	1	0	3	0	4	68
Montana:											
Billings.....	0		0	0	1	1	0	0	0	0	9
Great Falls.....	0		0	0	1	1	0	0	0	2	5
Helena.....	0		0	15	0	5	0	0	0	0	2
Missoula.....	0		0	0	1	0	2	0	0	0	10
Idaho:											
Boise.....	0		0	0	0	1	0	1	0	0	5
Colorado:											
Colorado Springs.....	0		0	1	1	8	0	1	0	0	11
Denver.....	3		1	2	5	14	1	4	1	52	91
Pueblo.....	0		0	0	1	3	0	0	0	0	
New Mexico:											
Albuquerque.....	0		0	0	0	5	0	4	0	9	11
Utah:											
Salt Lake City.....	0		0	20	0	18	0	0	0	11	20
Washington:											
Seattle.....	0		0	14	6	4	0	6	0	23	106
Spokane.....	0		0	0	1	6	0	1	0	9	26
Tacoma.....	0		0	0	1	4	0	0	0	0	32
Oregon:											
Portland.....	0		3	2	11	11	6	3	0	3	96
Salem.....	0	1		0		0	0		0	1	
California:											
Los Angeles.....	8	18	5	26	30	50	3	23	1	75	354
Sacramento.....	2	6	0	3	6	9	0	1	0	0	36
San Francisco.....	4	4	2	0	10	24	0	11	2	15	162

State and city	Meningococcus meningitis		Polio-myelitis cases	State and city	Meningococcus meningitis		Polio-myelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Georgia:			
Boston.....	1	0	0	Atlanta.....	1	2	0
New York:				Florida:			
New York.....	9	2	0	Miami.....	2	0	0
New Jersey:				Tampa.....	1	1	0
Newark.....	2	0	0	Tennessee:			
Pennsylvania:				Knoxville.....	3	0	0
Philadelphia.....	1	0	0	Memphis.....	1	2	0
Ohio:				Alabama:			
Cincinnati.....	0	1	0	Birmingham.....	9	4	0
Cleveland.....	1	1	0	Louisiana:			
Indiana:				New Orleans.....	5	0	0
Indianapolis.....	1	1	0	Shreveport.....	0	3	0
Illinois:				Texas:			
Chicago.....	4	2	0	Houston.....	1	0	0
Wisconsin:				San Antonio.....	3	1	0
Milwaukee.....	1	0	0	Colorado:			
Missouri:				Denver.....	1	0	0
St. Joseph.....	1	0	0	Washington:			
Maryland:				Spokane.....	2	0	0
Baltimore.....	4	2	0	Oregon:			
District of Columbia:				Portland.....	1	0	0
Washington.....	3	1	0	California:			
West Virginia:				Los Angeles.....	1	1	0
Wheeling.....	1	0	0				
South Carolina:							
Charleston.....	1	0	0				

*Encephalitis, epidemic or lethargic.*—Cases: New York, 1; Philadelphia, 1; Pittsburgh, 1; Columbus, 1; San Francisco, 1.

*Pellagra.*—Cases: Atlanta, 1; Savannah, 5; Nashville, 1; Birmingham, 1; Los Angeles, 2.

*Typhus fever.*—Cases: New York, 1; Gastonia, 1; Miami, 1; Birmingham, 1; Montgomery, 3.

## FOREIGN AND INSULAR

### CUBA

*Habana—Communicable diseases—4 weeks ended March 13, 1937.*—During the 4 weeks ended March 13, 1937, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria.....	25		Tuberculosis.....	13	1
Malaria.....	<sup>1</sup> 30		Typhoid fever.....	<sup>1</sup> 48	5
Scarlet fever.....	1				

<sup>1</sup> Includes imported cases.

### FINLAND

*Communicable diseases—February 1937.*—During the month of February 1937, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria.....	310	Scarlet fever.....	1, 165
Dysentery.....	2	Smallpox.....	1
Influenza.....	4, 606	Typhoid fever.....	22
Paratyphoid fever.....	3		

### GREAT BRITAIN

*England and Wales—Infectious diseases—14 weeks ended January 2, 1937.*—During the 14 weeks ended January 2, 1937, certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria.....	18, 248	Puerperal pyrexia.....	1, 570
Ophthalmia neonatorum.....	1, 097	Scarlet fever.....	29, 304
Pneumonia.....	11, 095	Smallpox.....	8
Puerperal fever.....	525	Typhoid fever.....	405

*England and Wales—Vital statistics—Fourth quarter, 1936.*—During the quarter ended December 31, 1936, 144,077 live births and 122,717 deaths were registered in England and Wales. The following vital statistics are taken from the Quarterly Return of Births, Deaths, and

Marriages, issued by the Registrar General of England and Wales, and are provisional:

*Birth and death rates in England and Wales, quarter ended Dec. 31, 1936*

Annual rates per 1,000 population:		Annual rates per 1,000 population—Continued.	
Live births.....	14.00	Deaths from—Continued	
Stillbirths.....	.59	Influenza.....	0.14
Deaths, all causes.....	12.00	Measles.....	.01
Deaths under 1 year of age.....	156.00	Scarlet fever.....	.01
Deaths from:		Typhoid fever and paratyphoid fever.....	.00
Diarrhea and enteritis (under 2 years		Violence.....	.55
of age).....	17.00	Whooping cough.....	.03
Diphtheria.....	.08		

<sup>1</sup> Per 1,000 live births.

### YUGOSLAVIA

*Communicable diseases—February 1937.*—During the month of February 1937, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax.....	21	1	Paratyphoid fever.....	7	2
Cerebrospinal meningitis.....	56	17	Pollomyelitis.....	2	1
Diphtheria and croup.....	765	78	Scarlet fever.....	347	3
Dysentery.....	23	1	Sepsis.....	13	4
Encephalitis.....	2		Tetanus.....	17	8
Erysipelas.....	237	14	Typhoid fever.....	173	29
Influenza.....	1,879	25	Typhus fever.....	125	5
Measles.....	1,485	6			

### CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for Mar. 26, 1937, pp. 372-385. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued Apr. 30, 1937, and thereafter, at least for the time being, in the issue published on the last Friday of each month.

#### Plague

*Plague on vessel.*—A case of plague was reported March 27, 1937, on the British S. S. *Magister* while under quarantine at Kingston, Jamaica. The diagnosis was confirmed bacteriologically on April 3. The vessel was fumigated, and appropriate precautionary measures were taken.

The *Magister* arrived at Kingston from the Brazilian ports of Maranhao, Para, and Manaus, and had touched previously at St. Lucia, Natal, Ceara, Parnahyba, Kingston (Jan. 1), and Port Arthur (Tex.), (Dec. 24, 1936).

#### Smallpox

*Gambia—Bathurst.*—On March 11, 1937, 4 cases of smallpox imported from MacCarthy's Island were reported in Bathurst, Gambia.

#### Yellow Fever

*Brazil.*—Yellow fever has been reported in Brazil as follows: Matto Grosso State: Maracaju, January 29 to February 11, 1937, 8 cases, 1 death; Ponto Pora, February 17, 1937, 1 death. Minas

Geraes State: Alfena, February 10-17, 1937, 2 deaths; Areiado, February 12, 1937, 1 death; Campos Geraes, February 20-25, 1937, 4 deaths; Lavras, February 20, 1937, 1 death; Sao Paulo State, Ribeirao Preto, February 26, 1937, 1 death.

*Gold Coast—Teshi.*—On March 16, 1937, 1 case of yellow fever was reported in Teshi, Gold Coast.

*Ivory Coast—Agboville.*—On March 18, 1937, 1 case of yellow fever was reported in Agboville, Ivory Coast.

×